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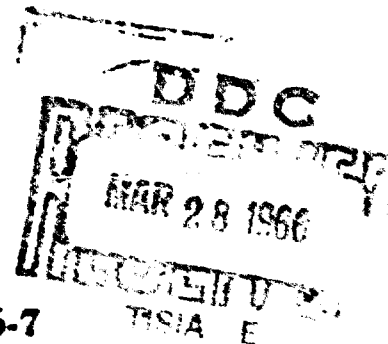
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**OXIDATION-CORROSION CHARACTERISTICS OF AIRCRAFT
TURBINE ENGINE LUBRICANTS**

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Southwest Research Institute

TECHNICAL REPORT NO. AFAPL-TR-66-7
February 1966



Air Force Aero Propulsion Laboratory
—Research and Technology Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

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ERRATA - March 1966

The following corrections are applicable to AFAPL-TR-66-7, Oxidation-Corrosion Characteristics of Aircraft Turbine Engine Lubricants, February 1966:

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Substitute the entire Table 1 given below for the Table 1 now printed on this page:

TABLE 1. DESCRIPTION OF TEST LUBRICANTS

Oil Code	Viscosity, cs		NN, mg KOH/g	Description
	100°F	210°F		
O-60-8	16.1	4.2	0.18	*MIL-L-7808 E type
O-60-18	12.1	3.2	0.19	MIL-L-7808 E
O-61-11	15.7	4.1	0.39	MIL-L-7808 E
O-62-3	15.5	3.8	0.02	MIL-L-7808 E
O-62-4	15.0	3.9	0.11	*MIL-L-7808 E type
O-62-6	17.8	4.7	0.24	MIL-L-7808 E
O-62-7	17.4	4.2	0.01	*MIL-L-7808 type
O-62-13	16.0	4.2	0.25	MIL-L-7808 E
O-62-16	16.8	4.4	0.22	MIL-L-7808 E
O-63-1	17.5	4.6	0.23	*MIL-L-7808 type
O-63-2	16.3	4.3	0.22	*MIL-L-7808 type
O-63-3	15.2	4.1	0.24	*MIL-L-7808 type
O-63-7	12.8	3.4	0.10	MIL-L-7808 type
O-63-8	13.8	3.5	0.15	*MIL-L-7808 E type
O-63-12	15.5	3.9	0.23	MIL-L-7808 type
O-63-13	16.9	4.4	0.05	MIL-L-7808 type
O-63-16	16.5	4.3	0.29	MIL-L-7808 E
O-64-2	27.5	5.1	0.07	MIL-L-23699
O-64-12	13.8	3.5	0.25	*MIL-L-7808 D
O-64-13	28.4	5.3	0.28	MIL-L-23699 type
O-64-16	13.1	3.3	0.17	MIL-L-7808 D
O-64-18	16.8	4.3	0.11	*MIL-L-7808 E
O-64-21	15.6	3.6	0.07	MIL-L-7808 type
O-64-22	18.3	4.1	0.17	MIL-L-7808 type
O-64-25	28.8	5.4	0.0	*MIL-L-23699
O-64-26	12.8	3.1	0.33	MIL-L-7808 type
O-65-1	14.9	3.8	0.07	MIL-L-7808 type
O-65-2	13.3	3.1	0.64	MIL-L-7808 type
O-65-3	17.0	4.5	0.24	MIL-L-7808 type
O-65-4	27.9	5.3	0.15	MIL-L-23699 type
O-65-5	19.4	4.0	0.15	MIL-L-7808 type
O-65-8	19.1	4.1	0.01	MIL-L-7808 type
O-65-14	17.7	4.7	0.24	MIL-L-7808 type
O-65-15	27.2	5.0	0.02	*MIL-L-23699
O-65-16	28.7	5.1	0.20	*MIL-L-23699
O-65-18	17.6	4.6	0.21	MIL-L-7808 type
O-65-19	17.7	4.7	0.25	MIL-L-7808 type
O-65-21	15.1	3.8	0.07	MIL-L-7808 type
O-65-23	12.6	3.2	0.20	MIL-L-7808 type
O-65-24	15.2	3.7	0.13	MIL-L-7808 type
O-65-27	15.2	4.0	0.26	MIL-L-7808 type
O-65-28	12.9	3.3	0.30	MIL-L-7808 type
O-65-31	13.4	3.2	0.08	MIL-L-7808 type
65-L-114	13.5	3.5	0.10	MIL-L-7808 E
65-L-115	14.3	1.6	0.09	MIL-L-7808 E
65-L-116	16.8	4.3	0.11	MIL-L-7808 E
J-1003(a)	14.8	3.8	0.10	Blend of 65-L-114, -115, and -116
J-1007(a)	16.5	4.2	0.15	Blend of O-62-3 and O-62-6
J-1011(a)	28.4	5.4	0.14	Blend of O-64-13 and O-64-25
J-1020(a)	27.9	5.2	0.17	Blend of O-64-2 and O-64-13
J-1021(a)	28.1	5.2	0.04	Blend of O-64-2 and O-64-25
J-1025(a)	28.2	5.2	0.12	Blend of O-64-2, O-64-13, and O-64-25

(a) Blends consist of equal parts by volume of the indicated constituents.

* Description changed from that shown in original report.

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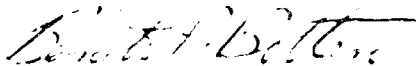
Southwest Research Institute

FOREWORD

This report was prepared at Southwest Research Institute under Contract AF 33(615)-2384. The contract was initiated under Project No. 3044, Task No. 304401. The work was administered by the Fuels, Lubrication, and Hazards Branch, Air Force Aero Propulsion Laboratory, Research and Technology Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. The project engineers were Messrs. G. A. Beane and L. J. DeBrohun and Lt. J. C. Ghiglieri.

This report covers one phase of work performed under the subject contract in the period of February 1, 1965 through September 1, 1965. The manuscript of this report was released by the authors October 1965 for publication as an AFAPL Technical Report.

This technical report has been reviewed and is approved.



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ABSTRACT

Oxidation-corrosion test data are presented for 46 lubricants, 40 MIL-L-7808 type lubricants and six MIL-L-23699 type lubricants, evaluated at one or more temperatures within the range of 350 to 400°F. In addition, the compatibility of selected lubricants when blended with lubricants of the same general class was evaluated. The test conditions which were varied were temperature and the use of reflux and nonreflux glassware configurations. Relatively mild oxidative degradation occurred at 350 and 375°F test conditions. Using an arbitrary rating point of 100 percent viscosity increase (100°F) as the maximum viscosity increase allowable for satisfactory performance, 23 of the 37 lubricants evaluated at 385°F were satisfactory using the nonreflux test procedure. Sixteen of the 29 lubricants evaluated at 390°F were satisfactory and only four of the 16 evaluated at 400°F provided satisfactory performance. The effect of condensate return at 385°F revealed that the majority of lubricants evaluated were unaffected.

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SECTION I

INTRODUCTION

This report summarizes a selected portion of the work performed at Southwest Research Institute in the period of February 1, 1965, through September 1, 1965, under Contract AF 33(615)-2384, entitled "Lubrication Research for Aero Propulsion Systems." The objectives of this broad program are the development or refinement of lubricant evaluation techniques for aero propulsion systems, and the evaluation of candidate lubricants and lubrication techniques. This report is concerned with only one phase of the overall effort: the oxidation-corrosion characteristics of selected lubricants and lubricant blends in the temperature regime of 350 to 400°F. Work performed under other phases has been dealt with in one previous report* and will be presented in other future reports.

The oxidation-corrosion characteristics of 46 lubricants and six lubricant blends were determined by means of a 48-hour glassware-type test, using a thermostated oil bath. These lubricants, all of MIL-L-7808 and MIL-L-23699 types, were selected and provided by the Air Force Aero Propulsion Laboratory.

*Lubrication Research for Aero Propulsion Systems, Phase Report No. 1, Bearing Support Deposits Program, AFAPL Technical Report 65-118, October 1965.

SECTION II

TEST APPARATUS AND PROCEDURES

A. Test Glassware

The test sample tubes are constructed of standard wall 51-mm Pyrex tubing with a round bottom. A standard taper 71/60 outer joint is provided at the tube top. Overall tube length is 450 ± 10 mm, and the tube immersion depth within the oil-bath is 225 ± 10 mm.

The test tube head is constructed with a standard taper 71/60 ground-glass joint on the lower end which mates with the test cell joint. The upper surface of the head is formed in a dome-shaped contour. Attached to this surface are three female, ground-glass joints. A 10/30 joint is centrally located to accommodate the air tube. A second 10/30 joint, slightly offset from center, provides for temperature measurements and intermediate sampling. Offset and at a 90° position from the sampling port, a 24/40 joint is attached to relieve effluent vapors. Using the condensate return procedure, a 300-mm water-cooled Allihn condenser is directly attached to the latter joint. The nonreflux test procedure employs a connecting arm, with a 15° downward slant, between the 24/40 joint and an overboard condenser. For this work, a 200-mm water-cooled Graham condenser was used.

An air delivery tube of standard 6-mm Pyrex tubing, approximately 600 mm in length, is fixed in the upper end of the head by means of a one-hole cork. The tip of the air tube is cut at a 45° angle and rests directly on the bottom of the sample tube. A small glass collar of sufficient size to hold the metal specimens is located 15 mm from the tip of the air tube. The bottom metal specimen rests directly on this collar, and succeeding specimens are separated by glass spacers 6-mm wide, cut from standard 9-mm Pyrex tubing.

B. Heating Bath

A stirred, thermostated oil bath was employed as the test glassware heat medium. The unit is operated within a fume hood to avoid toxic vapors. As illustrated in Figure 1, the enclosed bath is raised above bench level to allow for operation using overboard condensers for the collection of condensable vapors. The bath will accommodate a maximum of six sample tubes using either a nonreflux glassware configuration (Fig. 1) or a reflux configuration in which the vapor condensers are attached directly above the sample tubes. Tube immersion depth is such that the sample level is approximately 125 mm below the bath level at test temperature.

Temperature control of the oil bath is provided by four 600-watt immersion heaters, one of which is controlled by an adjustable thermostwitch.

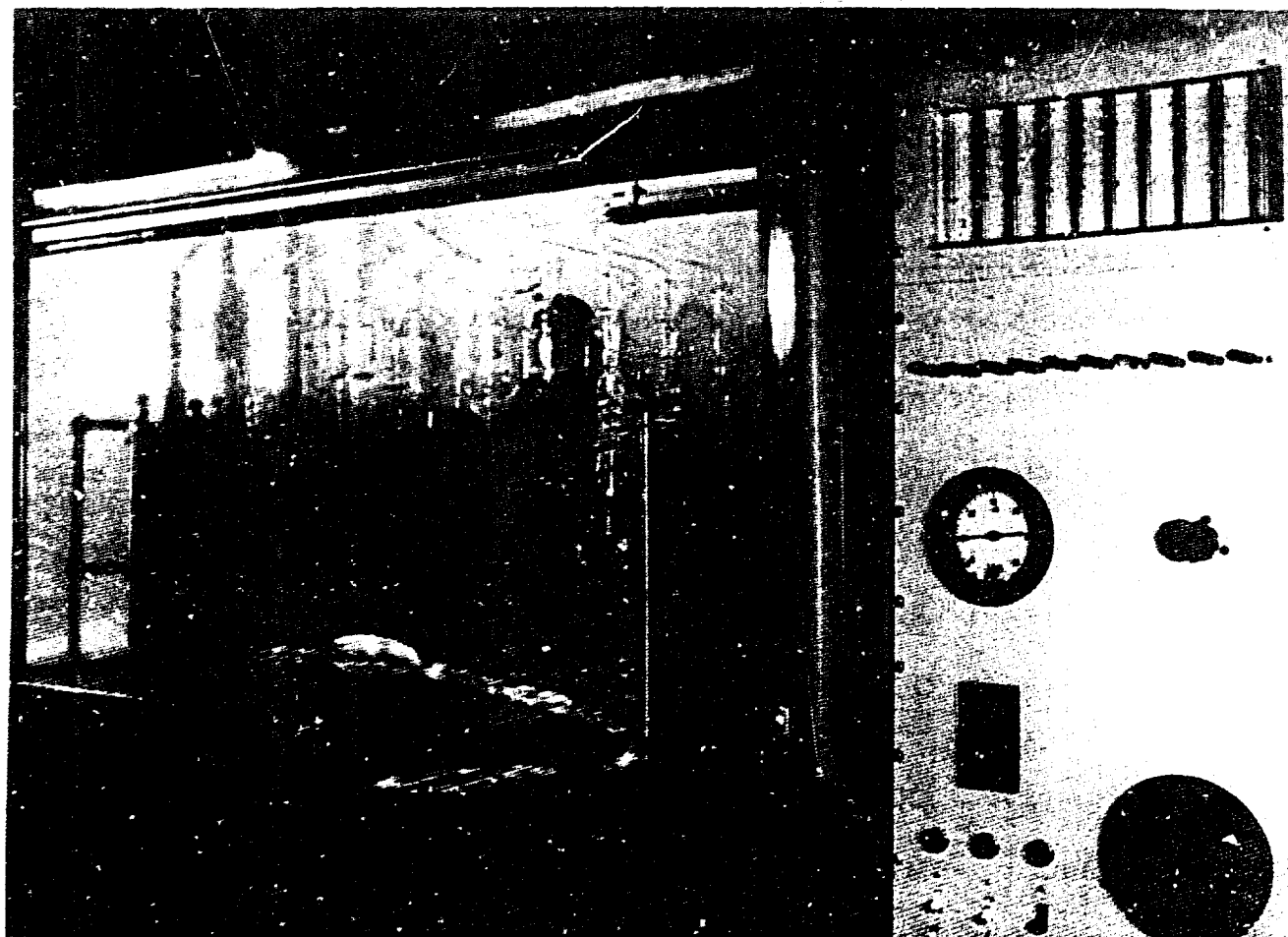


FIGURE 1. OXIDATION-CORROSION TEST APPARATUS

In operation, the continuously-on heater elements are adjusted for optimum control by means of a variable transformer.

C. Air Supply System

A precision air regulator is used to provide a constant air pressure to individual fine-thread needle valves from the laboratory air line. The air is passed through a 4-in. glass-pipe drying column, containing a calcium sulfate drier, thence to a manifold before reaching the individual test tube control valves and flowmeters. Each of the six air flowmeters was calibrated by means of a wet test meter in order to provide accurate measurement of the air flow rate.

D. Metal Test Specimens

The metal corrosion specimens are of the round washer type with dimensions 3/4-in. OD and 1/4-in. ID by 0.032-in. thickness. The following material designations apply to the metals which were used:

Aluminum	QQ-A-250/4b, temper T-3 or T-4
Silver	Electrolytic grade, 99.9%
Copper	QQ-C-576b
Mild steel	QQ-S-698, grade 1009, cold rolled, temper No. 4 or 5
Magnesium	QQ-M-44a (AZ31B)
Titanium	MIL-T-009046 B (ASG), Class 1

As previously noted, the specimens are stacked directly on the air tube, separated by 1/4-in. glass spacers. The metals are arranged in the order given above with aluminum in the lowest position.

E. Test Procedures

In evaluating the oxidation-corrosion properties of the submitted lubricants, only two test conditions were varied: sample temperature and the use of condensate return. In the initial stages of work, lubricant performance was determined at several temperatures (350, 375, 385, 390, and 400°F) in order to select that temperature which would result in a reasonable degradation level. Subsequent tests were generally limited to evaluation at 385 and/or 390°F. All temperatures cited herein refer to sample operating temperature, not bath temperature which is normally 2 to 3°F higher than the sample temperature.

The normal test duration was 48 hours with intermediate sampling (20 ml) at 16, 24, and 40 hours. In some instances, due to severe oil loss or deterioration, the run was terminated at an intermediate sample time. No makeup oil was added for the samples drawn or the oil losses.

The initial sample charge was 200 ml. Test air flow rate was 130 liters/hour dry air. A six-metal corrosion specimen group was used consisting of aluminum, silver, copper, mild steel, magnesium, and titanium.

All lubricant samples were analyzed to determine kinematic viscosity at 100 and 210°F, and neutralization number. In evaluations using the non-reflux apparatus, the overhead fluid was analyzed for 100°F viscosity and neutralization number. Metal specimen attack was determined by weight difference. In addition, the coupons were examined at a 20X microscope magnification to observe the type of metal corrosion, e.g., pitting or etching. Post-test preparation of the metal specimens included a successive rinse in benzene and acetone to remove oil. The individual specimens were benzene swabbed using a series of cotton swabs until clean swabs were noted. The coupons were finally rinsed in benzene and acetone, air dried, and weighed.

For one test series, an electrocleaning procedure was employed following the normal specimen cleanup. The individual metals, except aluminum, were cathodically cleaned in a hot (170 to 190°F) caustic bath. The bath contained an aqueous solution of 15 g/liter sodium hydroxide and 15 g/liter trisodium phosphate. The coupons were cleaned as the cathode for a period of 15 to 30 seconds using a current density of 0.5 amp/inch². After removal from the bath, the specimens were rinsed in cold water and cotton swabbed to remove loose deposits. The metals were weighed after a final rinse in acetone. The aluminum specimens were soaked in concentrated nitric acid for a period of 15 minutes, then rinsed and processed as described above.

Test glassware deposits and sludge were likewise recorded. After test, the entire sample was filtered through a 200-mesh screen to observe bulk sludge deposits. A 25-ml portion of the lubricant sample was then subjected to a 1-hour centrifuging at a relative force of 840 g's in order to measure suspended sludge.

In general, all candidate lubricants were initially evaluated using non-reflux of effluent vapors. Many of the oils were then run to determine the effect of refluxing. All other test conditions, including air flow rate, were the same for both cases. All determinations using condensate return were conducted at 385°F.

SECTION III

TEST LUBRICANTS

A total of 46 lubricants and six lubricant mixtures were evaluated at one or more of five sample temperatures used in the test series. Table 1 presents a listing of the lubricants employed in this program, along with initial viscosity and neutralization number data and available information on lubricant type. Six of the test fluids are typical of the class defined by specification MIL-L-23699. The remaining oils are related to the lubricant type described by MIL-L-7808.

TABLE 1. DESCRIPTION OF TEST LUBRICANTS

Oil Code	Viscosity, cs		NN, mg KOH/g	Description
	100°F	210°F		
O-60-8	16.1	4.2	0.18	MIL-L-7808 E
O-60-18	12.1	3.2	0.19	MIL-L-7808 E
O-61-11	15.7	4.1	0.39	MIL-L-7808 E
O-62-3	15.5	3.8	0.02	MIL-L-7808 E
O-62-4	15.0	3.9	0.11	MIL-L-7808 E
O-62-6	17.6	4.7	0.24	MIL-L-7808 E
O-62-7	17.4	4.2	0.01	MIL-L-7808 D
O-62-13	16.0	4.2	0.25	MIL-L-7808 E
O-62-16	16.8	4.4	0.22	MIL-L-7808 E
O-63-1	17.5	4.6	0.23	MIL-L-7808 D
O-63-2	16.3	4.3	0.22	MIL-L-7808 D
O-63-3	15.2	4.1	0.24	MIL-L-7808 D
O-63-7	12.8	3.4	0.10	MIL-L-7808 type
O-63-8	13.8	3.5	0.15	MIL-L-7808 E
O-63-12	15.5	3.9	0.23	MIL-L-7808 type
O-63-13	16.9	4.4	0.05	MIL-L-7808 type
O-63-16	16.5	4.3	0.29	MIL-L-7808 E
O-64-2	27.5	5.1	0.07	MIL-L-23699
O-64-12	13.8	3.5	0.25	MIL-L-7808 E
O-64-13	28.4	5.3	0.28	MIL-L-23699 type
O-64-16	13.1	3.3	0.17	MIL-L-7808 D
O-64-18	16.8	4.3	0.11	MIL-L-7808 type
O-64-21	15.6	3.6	0.07	MIL-L-7808 type
O-64-22	18.3	4.1	0.17	MIL-L-7808 type
O-64-25	28.8	5.4	0.0	MIL-L-23699 type
O-64-26	12.8	3.1	0.33	MIL-L-7808 type
O-65-1	14.9	3.8	0.07	MIL-L-7808 type
O-65-2	13.3	3.1	0.64	MIL-L-7808 type
O-65-3	17.0	4.5	0.24	MIL-L-7808 type
O-65-4	27.9	5.3	0.15	MIL-L-23699 type
O-65-5	19.4	4.0	0.15	MIL-L-7808 type
O-65-8	19.1	4.1	0.01	MIL-L-7808 type
O-65-14	17.7	4.7	0.24	MIL-L-7808 type
O-65-15	27.2	5.0	0.02	MIL-L-23699 type
O-65-16	26.7	5.1	0.20	MIL-L-23699 type
O-65-18	17.6	4.6	0.21	MIL-L-7808 type
O-65-19	17.7	4.7	0.25	MIL-L-7808 type
O-65-21	15.1	3.8	0.07	MIL-L-7808 type
O-65-23	12.6	3.2	0.20	MIL-L-7808 type
O-65-24	15.2	3.7	0.13	MIL-L-7808 type
O-65-27	15.2	4.0	0.26	MIL-L-7808 type
O-65-28	12.9	3.3	0.30	MIL-L-7808 type
O-65-31	13.4	3.2	0.08	MIL-L-7808 type
65-L-114	13.5	3.5	0.10	MIL-L-7808 E
65-L-115	14.3	3.6	0.09	MIL-L-7808 E
65-L-116	16.8	4.3	0.11	MIL-L-7808 E
J-1003(a)	14.8	3.8	0.10	Blend of 65-L-114, -115, and -116
J-1007(a)	16.5	4.2	0.15	Blend of O-62-3 and O-62-6
J-1011(a)	28.4	5.4	0.14	Blend of O-64-13 and O-64-25
J-1020(a)	27.9	5.2	0.17	Blend of O-64-2 and O-64-13
J-1021(a)	28.1	5.2	0.04	Blend of O-64-2 and O-64-25
J-1025(a)	28.2	5.2	0.12	Blend of O-64-2, O-64-13, and O-64-25

(a) Blends consist of equal parts by volume of the indicated constituents.

SECTION IV

TEST RESULTS AND DISCUSSION

A. Effect of Test Temperature

As a consequence of the large volume of data generated by this work, the following discussions are generally confined to the use of data summaries. Tables 10 to 168 in the Appendix present the detailed results of all determinations. These tables are listed in numerical order by oil code and not necessarily by the testing sequence.

Lubricant viscosity increase was used in this program as the primary criterion in determining lubricant performance. As a general rule, a 100°F viscosity increase in excess of 100 percent was arbitrarily considered the failing point. This rule was not strictly applied, however, and was not intended by any means to indicate official Air Force approval or disapproval. One hundred percent lubricant viscosity increase was used herein chiefly as a dividing line in categorizing fluid capability.

Table 2 summarizes viscosity increase data as affected by increasing test temperature. Lubricant degradation generally followed the normal trend with respect to increasing sample temperature. Viscosity indicated a gradual rise with temperature up to the level of about 100 percent increase. At temperatures beyond that for which a 100 percent viscosity increase was obtained, sample deterioration abruptly accelerated. This observation normally held true with respect to sample neutralization number as shown in Table 3. A typical example of this trend is illustrated for lubricant O-62-3 in Figure 2.

Using 100 percent viscosity increase as the measure of lubricant performance, Table 2 shows that all lubricants evaluated at 350°F underwent relatively mild degradation. Similarly, of the 16 lubricants tested at 375°F, only O-60-8 was unsatisfactory. At the maximum temperature investigated, 400°F, severe deterioration, and in most cases gelation, of the lubricant occurred at 48 hours. Sixteen lubricants were run at 400°F and four showed a passing performance. Of these four, O-63-8, O-64-12, and O-64-22 were MIL-L-7808 type and O-64-2 was MIL-L-23699 type. The remaining five MIL-L-23699 lubricants were not examined at 400°F.

In view of the foregoing observations, it is apparent that the test temperature of most interest, i. e., which gives a reasonable separation among the lubricants, lies within a rather narrow range between 375 and 400°F. Thus, as shown by Table 2, the bulk of the program was conducted at 385 and 390°F. On the basis of sample viscosity, the following data classify the lubricant group with regard to temperature capability:

TABLE 2. SUMMARY OF OXIDATION-CORROSION TEST
VISCOSITY INCREASE DATA

Oil Code	100°F Viscosity Increase, % at 48 hr, for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	40	145	390	482	Gelled(c)
O-60-18	10	15	25	32(a)	38 (a, c)
O-61-11	19	44	103(a)	153(a)	82 (c)
O-62-3	26	48	72	86(a)	387 (a)
O-62-4	17	43	107(a)	241	128 (c)
O-62-6	23	67	122(b)	176(a, c)	Gelled(c)
O-62-7				144	
O-62-13		66	144	327	Gelled(c)
O-62-16		57	70	155(a, c)	Gelled(c)
O-63-1				428	
O-63-2				94	
O-63-3				871(c)	
O-63-7				67(c)	
O-63-8		29	20	24	38
O-63-12				62	
O-63-13				26	
O-63-16			170	320	Gelled(c)
O-64-2		15	19	22	28
O-64-12		13	14	16	23
O-64-13		17	24	26	183
O-64-16			5	28(a)	1365(c)
O-64-18		20	27	31	1140(c)
O-64-21				8	
O-64-22			10	12	16
O-64-25			11		
O-64-26			109	127	
O-65-1			532	2402	
O-65-2			50	60	
O-65-3			319		
O-65-4			16	18	
O-65-5			31	38	
O-65-8			8(a)		
O-65-14			577		
O-65-15			16		
O-65-16			16		
O-65-18			148		
O-65-19			59		
O-65-21			76		
O-65-23			141		
O-65-24			34		
O-65-27			1768		
O-65-28			12,650		
O-65-31			59		
65-L-114		27	52		
65-L-115		16	22		
65-L-116		17			

Without condensate return

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

(c) Values are 40-hr results. In all cases where data are shown for 40 hr, the sample indicated gelation at 48 hr.

TABLE 3. SUMMARY OF OXIDATION-CORROSION TEST
NEUTRALIZATION NUMBER DATA

Oil Code	48-hr Neutralization Number, mg KOH/g. for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	0.49	1.08	1.67	1.68	25.4 (c)
O-60-18	0.42	0.73	1.10	1.64(a)	1.98(a, c)
O-61-11	0.33	0.85	1.28(a)	1.69(a)	1.71(c)
O-62-3	0.52	0.86	1.21	1.41(a)	10.05(a)
O-62-4	0.62	1.23	1.70(a)	2.22	2.49(c)
O-62-6	0.58	0.90	8.75(b)	33.6 (a)	37.9 (c)
O-62-7				9.01	
O-62-13		1.03	1.54	3.17	25.2 (c)
O-62-16		0.99	13.96	31.3 (a)	40.1 (c)
O-63-1				18.93	
O-63-2				11.58	
O-63-3				23.7	
O-63-7				1.39(c)	
O-63-8		0.55	0.50	0.63	0.91(a)
O-63-12				0.91	
O-63-13				1.65	
O-63-16			1.14	6.73	30.3 (c)
O-64-2		0.31	0.38	0.36	0.47
O-64-12		0.96	1.27	1.36	2.24
O-64-13		0.07	0.10	0.09	5.73
O-64-16			1.57	12.68(a)	49.6
O-64-18		1.10	1.69	3.19	34.8 (c)
O-64-21				0.26	
O-64-22			0.41	0.48	0.54
O-64-25			0.15		
O-64-26			0.41	0.46	
O-65-1			26.2	21.5	
O-65-2			0.09	0.07	
O-65-3			2.01		
O-65-4			0.50	0.48	
O-65-5			0.30	0.31	
O-65-8			0.21(a)		
O-65-14			28.9		
O-65-15			0.45		
O-65-16			0.54		
O-65-18			1.85		
O-65-19			1.29		
O-65-21			1.25		
O-65-23			0.84		
O-65-24			0.64		
O-65-27			3.48		
O-65-28			21.80		
O-65-31			0.65		
65-L-114		0.83	1.19		
65-L-115		0.43	0.49		
65-L-116		0.98			

Without condensate return.

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

(c) Values are 40-hr results.

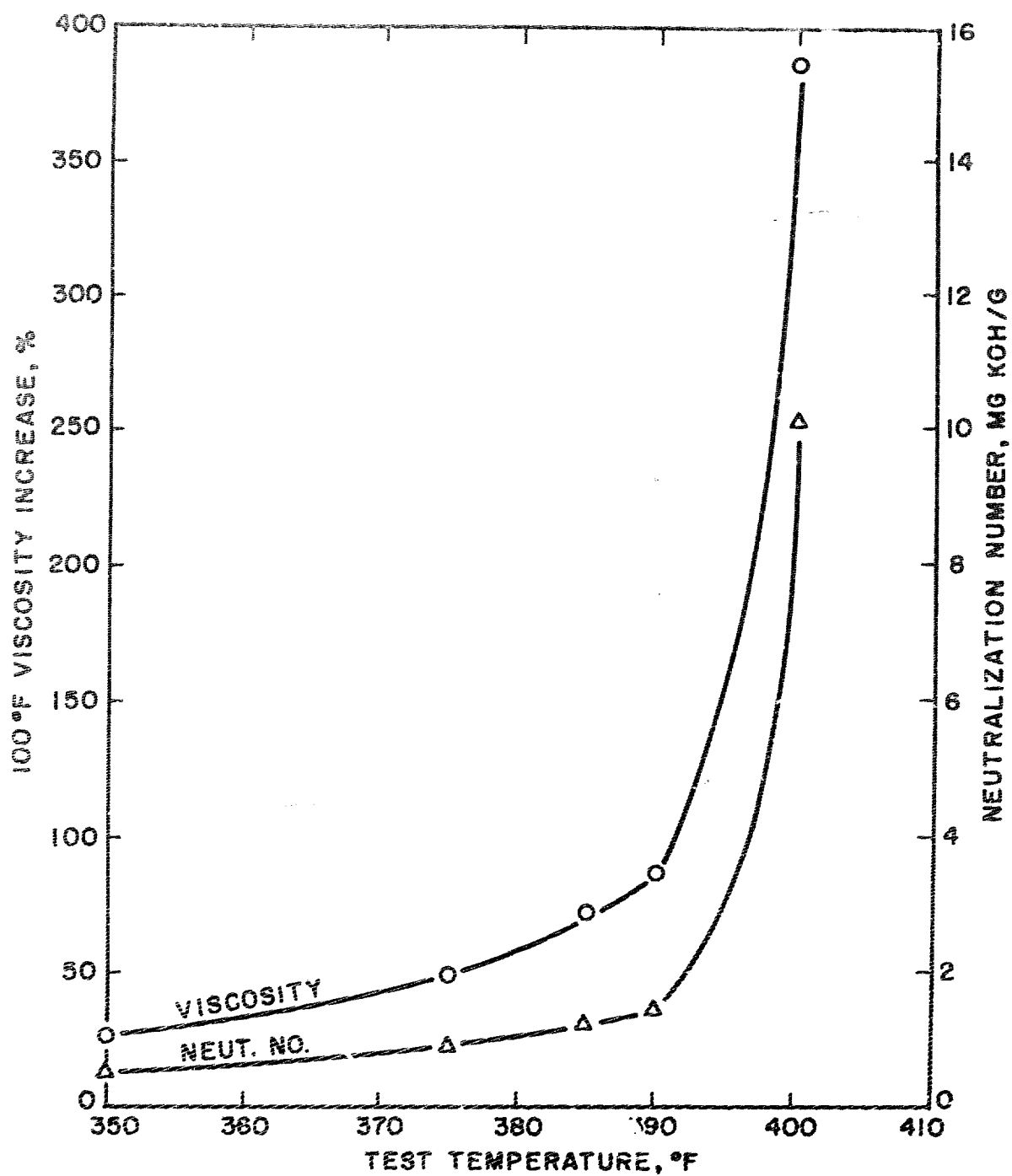


FIGURE 2. EFFECT OF TEMPERATURE ON THE
OXIDATIVE DETERIORATION OF O-62-3

	Test Temperature, °F				
	<u>350</u>	<u>375</u>	<u>385</u>	<u>390</u>	<u>400</u>
Number of lubricants tested	6	16	37	29	16
Number of lubricants passed	6	15	23	16	4

Several duplicate determinations were conducted using the nonreflux test configuration in order to verify the repeatability of the procedure. These results showed very good correspondence of all measured data. The repeatability of viscosity data was the primary concern in this study and, as illustrated by the analysis given in Table 4, the results showed rather good agreement. Only one instance of poor repeatability of duplicate tests was observed. Lubricant O-62-3 when tested at 400°F gave a difference from the mean of 52 percent. This variation, however, is not considered significant in view of the very high level of fluid degradation. The individual determinations in this case were 590 and 184 percent viscosity increase at 100°F.

Metal specimen corrosion for this test series was observed in several cases but was generally confined to the copper and magnesium metals. Significant metal corrosion as described here is defined as a specimen weight loss of 0.20 mg/cm², or more. Some lubricants, which will be identified later, caused significant specimen weight gains, i. e., an increase of 0.20 mg/cm², or more. The latter phenomenon was not restricted to a particular metal type but affected all specimens of the group at random.

Table 5 lists the lubricants and metals for which significant corrosion was obtained in the nonreflux test series. Where no comment is noted for a particular temperature in the table, no test was conducted for that lubricant-temperature combination. As mentioned earlier, corrosion was generally limited to the copper and magnesium metals. The sole exception was a measurable weight loss for silver in the O-61-11 test conducted at 390°F. None of the lubricants evaluated at 350°F showed corrosion of any type. As illustrated in Table 5, metal attack in the 375°F determinations was relatively rare and was confined to copper only. It will be noted that, up to and including the 385°F runs, copper was the only metal indicating attack. At 390 and 400°F, corrosion was more frequently noted for copper, along with two cases of magnesium attack at 390°F and six cases at 400°F.

As discussed herein, metal specimen condition is separated according to those instances of corrosion (weight loss) and those of deposition (weight gain). In the latter case, it should be noted that a combination of corrosion and deposition may prevail, i. e., metal weight loss might be obscured by the presence of significant deposits which cause an overall weight gain.

TABLE 4. REPEATABILITY OF OXIDATION-CORROSION
TEST VISCOSITY RESULTS

<u>Oil Code</u>	<u>No. of Det's</u>	<u>Test Temp, °F</u>	<u>Mean 100°F Vis Increase, %</u>	<u>Max Difference from Mean^(a), %</u>
O-60-18	2	390	32	1
	2	400	38(b)	3
O-61-11	2	385	103	15
	2	390	153	12
O-62-3	2	390	86	1
	2	400	387	52
O-62-4	2	385	107	6
O-62-6	3	385	122	6
	2	390	176(b)	18
O-62-16	2	390	155(b)	12
O-64-16	2	390	28	11
O-65-8	2	385	8	0

Without condensate return.

(a) Max difference from mean $\times 100/\text{mean}$

(b) Values are 40-hr results.

TABLE 5. SIGNIFICANT METAL SPECIMEN CORROSION

Oil Code	Significant Metal Corrosion for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	None	None	None	Cu	Cu, Mg
O-61-11	None	None	None	Ag	None
O-62-3	None	None	None	Cu	Cu, Mg
O-62-6	None	None	Cu	Cu	Cu, Mg
O-62-7				Cu	
O-62-13		None	None	None	Cu
O-62-16		None	None	Cu	Cu, Mg
O-63-7				Cu, Mg	
O-63-8		Cu	Cu	Cu, Mg	Cu
O-63-12				Cu	
O-63-16			None	None	Mg
O-64-2		None	None	None	Cu
O-64-13		Cu	Cu	Cu	Cu
O-64-18		None	None	Cu	Cu
O-64-21				Cu	
O-64-22			None	None	Mg
O-64-26			Cu	Cu	
O-65-1			Cu	Cu	
O-65-2			Cu	Cu	
O-65-4			Cu	Cu	
O-65-5			Cu	Cu	
65-L-115		Cu	None		

Significant metal corrosion, as used here, is defined as a specimen weight loss of 0.20 mg/cm² or more.

The occurrence of significant metal specimen weight gain is described in Table 6. Again, the phenomenon is seen to occur more frequently at the higher test temperatures. In addition, it is apparent that no one metal type was predominantly affected. All metals were susceptible to the deposition effect. Those instances in which all specimens except copper showed significant weight gains are probable illustrations of the effect mentioned previously whereby metal corrosion (weight loss) was offset by the added deposit weight.

The use of an electrocleaning procedure was briefly investigated in the assessment of metal specimen corrosion. The technique was employed on one set of six lubricants evaluated at 385°F using nonreflux. After the normal post-test cleanup, all specimens were processed with the electrocleaning method. The results indicated that specimen weight change was essentially unaffected except for one instance using lubricant O-64-26. These data are listed here:

	Weight Change, mg/cm ²	
	<u>Normal</u>	<u>Electrocleaned</u>
Al	0.0	-0.06
Ti	0.0	-0.02
Ag	-0.06	-0.06
Steel	0.0	-0.02
Cu	-0.28	-0.36
Mg	+0.20	+0.06

Although electrocleaning resulted in a slight weight loss for most metals, the major change occurred with the magnesium specimen which underwent a net weight loss of 0.14 mg/cm². Out of a total of 36 specimens processed, this was the only effect of significance. It should be stated, however, that none of the metals used in this study showed visible evidence of carbonaceous deposits. Had such deposits been present, it is expected that the effect of electrocleaning would have been more pronounced.

B. Effect of Condensate Return

Several of the submitted lubricants were investigated using a condensate return glassware apparatus in order to determine the effect of refluxing of condensable effluent vapors. All runs with this procedure were conducted at 385°F with all other conditions unchanged from those tests performed with nonreflux. Attention is particularly called to the test air flow rate of 130 liters/hour which was used in both reflux and nonreflux tests. As a consequence of the relatively high air flow used, condensation efficiency is very low. Thus, only slight refluxing was actually obtained when using the condensate return configuration. This fact is substantiated by oil loss data which indicate little or no difference in sample weight loss between reflux and nonreflux tests on the test fluids at 385°F.

TABLE 6. SIGNIFICANT METAL SPECIMEN DEPOSITS

Oil Code	Significant Weight Gain for Test at				
	350°F	375°F	385°F	390°F	400°F
O-60-8	None	Steel	None	None	None
O-60-18	Steel	All	All	All less Cu	All less Cu
O-61-11	None	Ag, Cu, Mg	Ag, Cu	Cu	All less Ti, steel
O-62-13		None	None	None	Ti
O-64-2		None	None	None	Steel
O-64-12		Mg	All less Cu	Al, Ti, Mg	All less Cu
O-64-16			None	All	Al, Ti, Ag
O-65-27			Mg		

Significant weight gain, as used here, is defined as a specimen weight gain of 0.20 mg/cm² or more.

Oxidation-corrosion test data are given in Table 7 on the effect of condensate return. Viscosity and neutralization number results are compared for both test methods. A large majority of the lubricants examined in this study were unaffected by the reflux procedure. However, some fluids showed a marked effect, and the technique served both to improve or worsen performance depending on oil type. Lubricants O-62-4, O-62-6, O-65-18, O-65-27, and O-65-28 showed increased oxidative stability when run with the reflux procedure. The use of condensate return had a deleterious effect on the performance of O-62-16 and O-65-21. For all lubricants mentioned, the effect was consistently reflected by the sample properties of viscosity and acidity. A seemingly unusual phenomenon, however, was indicated for O-65-19. Viscosity data for this oil showed no effect for refluxing. Sample neutralization number, however, gave almost an eightfold increase in the reflux determination. This result is assumed to be a unique characteristic of the lubricant.

It is interesting to note that of the six MIL-L-23699 type lubricants included in this work none was affected by the reflux method. All of the lubricants which were one way or another susceptible to vapor refluxing were of the MIL-L-7808 type.

Metal specimen corrosion data in the reflux determinations were generally unchanged from the results shown in nonreflux tests, but with two exceptions. Lubricant O-65-21, which gave no significant metal attack in nonreflux oxidation-corrosion tests, showed weight losses of 0.27 and 0.73 mg/cm² for copper and magnesium, respectively. The lubricant was of the group which likewise showed increased deterioration of oil properties using condensate return. Similarly, O-65-28 indicated a copper weight loss of -0.40 mg/cm² in the reflux test, but the metal was unaffected using the non-reflux procedure.

C. Results on Lubricant Blends

At the direction of AFAPL, six lubricant blends were prepared and evaluated in oxidation-corrosion tests under specified conditions. The blends consisted of equal parts by volume of selected lubricants previously examined in the program. Two of the mixtures, J-1003 and J-1007, were composed of MIL-L-7808 type lubricants while the other four were blends of MIL-L-23699 type lubricants (Table 1).

Table 8 presents viscosity increase results on the oil mixtures. The blends are grouped in the table with their respective constituent oils. In general, no unusual effects were noted in this work. The 375°F test results on J-1003 showed no deleterious effect attributable to any incompatibility of the three constituents. In fact, viscosity data for the blend were very close to the arithmetical average of results obtained with the individual oils. The performance of J-1003 was further investigated by a test employing moist

TABLE 7. OXIDATION-CORROSION TEST RESULTS ON THE
EFFECT OF CONDENSATE RETURN AT 385°F

OH Code	100°F Vis Increase, % at 48 hr		48-hr NN, mg KOH/g	
	Nonreflux	Reflux	Nonreflux	Reflux
O-62-3	72	71(a)	1.21	1.10(a)
O-62-4	107(a)	79	1.70(a)	1.14
O-62-6	122(b)	54(a)	8.75(b)	7.90(a)
O-62-16	70	110	13.96	21.9
O-63-16	170	153	1.14	1.17
O-64-2	19	18	0.38	0.31
O-64-13	24	23	0.10	0.04
O-64-22	10	10	0.41	0.46
O-64-25	11	10(a)	0.15	0.15(a)
O-64-26	109	106	0.41	0.47
O-65-1	532	639	26.2	29.2
O-65-2	50	51	0.09	0.06
O-65-3	319	271	2.01	1.83
O-65-4	16	15	0.50	0.45
O-65-5	31	32	0.30	0.31
O-65-8	8(a)	8	0.21(a)	0.21
O-65-14	577	452	20.9	30.7
O-65-15	16	16	0.45	0.45
O-65-16	16	16	0.54	0.59
O-65-18	148	129	1.85	1.68
O-65-19	59	48	1.29	10.49
O-65-21	76	174	1.25	26.4
O-65-23	141	148	0.84	0.86
O-65-24	34	30	0.64	0.62
O-65-27	1768	226	3.48	2.27
O-65-28	12,650	6559	21.8	18.75
O-65-31	59	58	0.65	0.65

(a) Average of duplicate determinations.

(b) Average of triplicate determinations.

TABLE 8. VISCOSITY INCREASE DATA ON LUBRICANT
BLENDS AND BLEND CONSTITUENTS

Oil Code	100°F Vis Increase, %, for Test at		
	375°F, Nonreflux	385°F Nonreflux	Reflux
65-L-114	27		
65-L-115	1		
65-L-116	17		
J-1003	23		
J-1003	21(a)		
O-62-3		72	72(c)
O-62-6		122(b)	54(c)
J-1007		96	84(c)
O-64-13		24	23
O-64-25		11	10(c)
J-1011		18	19
O-64-2			18
O-64-13			23
J-1020			19
O-64-2			18
O-64-25			10(c)
J-1021			14
O-64-2			18
O-64-13			23
O-64-25			10(c)
J-1025			15

(a) Test performed with water-saturated air.

(b) Average of triplicate determinations.

(c) Average of duplicate determinations.

air, rather than dry air as normally used. The air was passed through a diffuser stone submerged in distilled water prior to entering the test tube. The results of this run, however, did not differ in any aspect from those obtained in the dry air test. The trend exhibited by J-1003 was characteristic of all other blends except for J-1007. The nonreflux determination on this mixture demonstrated the expected effect, i. e., blend performance was rated between that of its constituents. In contrast, the J-1007 run with condensate return indicated a slight adverse effect, i. e., viscosity increase indicated a level of degradation more severe than that obtained for either of the two constituents. This effect is not considered to be too significant, however, as the value obtained for the blend was well within the repeatability variation of the constituent lubricant O-62-3.

Neutralization number data are given in Table 9 for the tests performed on the lubricant mixtures. These results confirmed the effects demonstrated by viscosity with the exception of blend J-1007. The blend acidity value, in both reflux and nonreflux tests, was very close to that for the lower of the two constituents, viz., O-62-3. In the case of the reflux test, this effect is in direct contradiction with the deterioration profile shown by viscosity data for J-1007.

Metal specimen data obtained in the blend experiments showed no evidence of lubricant incompatibility with respect to metal attack. In other words, none of the lubricant blends indicated metal corrosion which had not been previously noted for one of the blend constituents. The results do, however, provide an indication of the predominating influence of the individual lubricants. J-1003, for example, showed no evidence of metal corrosion at 375°F although one of its constituents, 65-L-115, gave significant copper corrosion. Similarly, J-1007 indicated no specimen attack with or without refluxing, whereas O-62-6 corroded copper. Significant metal corrosion for the MIL-L-23699 blends is given here for the 385°F reflux determinations:

Constituent Oils			Blended Oils			
<u>O-64-2</u>	<u>O-64-13</u>	<u>O-64-25</u>	<u>J-1011</u>	<u>J-1020</u>	<u>J-1021</u>	<u>J-1025</u>
	Cu	None	Cu			
None	Cu			None		
None		None			None	
None	Cu	None				None

Lubricant O-64-13 exhibited the predominating effect in the J-1011 blend since both tests showed copper corrosion, although O-64-25 did not when tested singly. Similar performance was observed in the nonreflux tests on these fluids. When O-64-13 was blended with O-64-2, however, the resultant mixture did not give copper attack in the oxidation-corrosion test. Further, an equal-part mixture (J-1025) of all three lubricants likewise showed no metal corrosion.

TABLE 9. NEUTRALIZATION NUMBER DATA ON LUBRICANT
BLENDS AND BLEND CONSTITUENTS

Oil Code	48-hr NN, mg KOH/g, for Test at		
	375° F,	385° F	
	Nonreflux	Nonreflux	Reflux
65-L-114	0.83		
65-L-115	0.83		
65-L-116	0.98		
J-1003	0.84		
J-1003	0.89(a)		
O-62-3		1.21	1.10(c)
O-62-6		8.75(b)	7.90(c)
J-1007		1.47	1.34(c)
O-64-13		0.10	0.04
O-64-25		0.15	0.15(c)
J-1011		0.08	0.11
O-64-2			0.31
O-64-13			0.04
J-1020			0.15
O-64-2			0.31
O-64-25			0.15(c)
J-1021			0.29
O-64-2			0.31
O-64-13			0.04
O-64-25			0.15(c)
J-1025			0.17

(a) Test performed with water-saturated air.

(b) Average of triplicate determinations.

(c) Average of duplicate determinations.

SECTION V

CONCLUSIONS

Using a 48-hour nonreflux oxidation-corrosion test procedure, 46 test lubricants were evaluated at one or more temperatures within the range of 350 to 400°F. Relatively mild oxidative degradation occurred at 350 and 375°F. At 400°F, lubricant deterioration was very severe with only four out of 16 of the lubricants tested giving satisfactory performance. Consequently, the major testing effort was confined to the temperatures of 385 and 390°F. The 385°F series indicated 23 satisfactory lubricants out of 37 examined. At 390°F, 16 lubricants passed from among a total of 29 tested.

Several duplicate determinations were made to verify the repeatability of the test procedure. The agreement of data was good in all cases except at very high levels of lubricant deterioration, where wide variability of data is normally anticipated.

Metal specimen condition in the nonreflux determinations indicated corrosion almost exclusively of copper and magnesium with several oils. The severity and frequency of attack increased with increasing test temperature. Similarly, the occurrence of specimen deposits was more frequently noted at the higher temperatures investigated. In the latter case, however, all metal types were susceptible to deposit formation. A cursory study to evaluate the applicability of a specimen electrocleaning technique showed essentially no difference for metal weight data. It is felt that a more significant effect would have been obtained on specimens which sustained visible deposits.

Results on the effect of condensate return at 385°F revealed that a large majority of the 19 lubricants tested were unaffected. Lubricants O-62-4 and O-62-6, however, showed improved performance in reflux tests, whereas O-62-16 and O-65-21 were less stable. Lubricant O-65-19 indicated no change in viscosity data between the reflux and nonreflux runs, but gave a substantially higher neutralization number in the reflux determination. None of the MIL-L-23699 type fluids was affected by vapor refluxing.

Six lubricant blends incorporating various combinations of eight individual lubricants were examined in this work. Oxidation-corrosion test results indicated no significant incompatibility of lubricant constituents. Blend J-1007 (mixture of O-62-3 and O-62-6) in a vapor reflux test indicated a slight adverse effect in that the deterioration, as noted by viscosity increase, was more severe than that of either of its constituents. However, this effect is not considered to be conclusive since the value obtained for the blend was within the repeatability range of the constituent lubricant O-62-3. Sample neutralization number of this blend followed that of O-62-3, the lower acidity value of the two constituents.

APPENDIX
DETAILED OXIDATION-CORROSION TEST DATA

TABLE 10. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 at 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss,		Overhead Sample	
					Wt, g	wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.12	--	4.20	0.18	--			
16 hr	17.38	7.8	4.29	0.38	18.8			
24 hr	18.06	12.0	4.62	0.36	27.6			
40 hr	19.38	26.4	5.08	0.36	45.5			
48 hr	22.61	40.3	5.52	0.49	53.5	34	0.73	9.60

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.06		Centrifuge	Trace
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	None
	Cu	+0.02		At and above oil level	None
	Mg	-0.06			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	
Ti	Lt tan	Sample temperature, °F
Ag	Lt yellow	Sample volume, ml
Steel	Blue	Air rate, liter/hr
Cu	Lt green	Condensate return
Mg	NC	No

TABLE 11. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss,		Overhead Sample	
					Wt, g	wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.12	--	4.20	0.18				
16 hr (a)	18.01	11.7	4.58	0.50	30.6			
24 hr	19.75	22.5	4.94	0.54	46.2			
40 hr	27.60	71.2	6.44	0.65	75.2			
48 hr	39.43	145	8.51	1.08	88.0	52	0.90	9.65

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.04	Sludge in Oil:	200-mesh filter	None
	Ti	-0.04		Centrifuge	Trace
	Ag	+0.06			
	Steel	+0.20	Tube deposits:	Below oil level	None
	Cu	0.0		At and above oil level	None
	Mg	+0.16			

Metal discoloration, deposits,
pitting, or etching:

Al	NC	Sample temperature, °F	375
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Dark blue	Condensate return	No
Cu	NC		
Mg	NC		

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 12. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F	
Initial	16.12	--	4.20	0.18	--				
16 hr	18.89	17.2	4.80	0.45	42.1				
24 hr	21.74	34.9	5.34	0.59	63.0				
40 hr	41.29	156	8.71	1.13	96.6				
48 hr	79.03	390	14.29	1.67	101.3	60	1.14		9.66
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Al	+0.02	Sludge in oil:		200-mesh filter	None
				Ti	+0.04			Centrifuge	(a)
				Ag	+0.06				
				Steel	+0.08	Tube deposits:		Below oil level	None
				Cu	-0.08			At and above oil level	None
				Mg	+0.02				
Metal discoloration, deposits, pitting, or etching:									
Al				NC		Sample temperature, °F		385	
Ti				Brown		Sample Volume, ml		200	
Ag				Lt yellow		Air rate, liter/hr		130	
Steel				Blue-green		Condensate return		No	
Cu				Lt pink					
Mg				NC					

(a) Insufficient sample.

TABLE 13. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 at 390 °F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.20	0.18	--			
16 hr	22.0	4.90	0.54	50.8			
24 hr	47.6	5.70	0.73	75.9			
40 hr	273	11.40	1.67	105.4			
48 hr	482	16.14	1.68	106.1	65	1.39	9.68
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag				Tube deposits: Below oil level			
Steel				At and above oil level			
Cu							
Mg							
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu							
Mg							

(a) Insufficient sample.

TABLE 14. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-8 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.20	0.18	--			
16 hr	23.9	4.98	0.91	57.7			
24 hr	97.1	6.35	18.35	91.4			
40 hr	--	--	25.4	113.3			
48 hr	--	--	--	--	71	10.44	9.69
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:		200-mesh filter	(a)
		Ti	-0.02			Centrifuge	(a)
		Ag	+0.10	Tube Deposits: Below oil level			
		Steel	+0.02	At and above oil level			
		Cu	-7.6	Med var			
		Mg	-0.34	Med var			
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
Al		NC	Sample temperature, °F		400		
Ti		Lt blue	Sample Volume, ml		200		
Ag		NC	Air rate, liter/hr		130		
Steel		Blue-green	Condensate return		No		
Cu		Severe etching					
Mg		Slight pitting					

(a) Test terminated at 40 hr, sample gelled.

TABLE 15. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	12.73	4.9	3.27	0.30	13.6			
24 hr	13.03	7.4	3.37	0.36	19.3			
40 hr	13.32	9.8	3.45	0.40	31.0			
48 hr	13.30	9.6	3.40	0.42	36.5	23	1.36	10.75

Metal Specimen Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.10 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Med var
	Cu		At and above oil level	None
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Al	Lt brown
Ti	Lt tan
Ag	Lt yellow
Steel	Hvy varnish
Cu	Lt brown
Mg	Grey

Test Conditions

Sample temperature, °F	350
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 16. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 375°F

<u>Sample Data</u>						<u>Overhead Sample</u>		
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt%	Acidity,	Vis,
							mg KOH/g	cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr (a)	13.08	7.8	3.36	0.56	22.9			
24 hr	13.21	8.9	3.44	0.61	33.9			
40 hr	14.08	16.1	3.55	0.61	55.2			
48 hr	13.92	14.3	3.51	0.73	65.0	39	1.81	11.00
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>						
Weight change, mg/cm ² :		Al	+0.26		Sludge in oil:	200-mesh filter	None	
		Ti	+0.24			Centrifuge	0.05 ml/25	
		Ag	+0.26					
		Steel	+0.36		Tube deposits:	Below oil level	Med carbon	
		Cu	+0.20			At and above oil level	Med carbon	
		Mg	+0.45					
Metal discoloration, deposits, pitting, or etching:		Al	Lt brown					
		Ti	Tan		Sample temperature, °F 375			
		Ag	Lt carbon		Sample volume, ml 200			
		Steel	Hvy varnish		Air rate, liter/hr 130			
		Cu	Lt varnish		Condensate return No			
		Mg	Lt carbon					

TABLE 17. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
								Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--		3.17	0.19	--			
16 hr	13.47	11.0		3.48	0.65	31.2			
24 hr	13.72	13.1		3.52	0.72	46.5			
40 hr	14.52	19.7		3.63	0.93	73.8			
48 hr	15.19	25.2		3.65	1.10	85.0	50	2.33	11.21

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.22	Sludge in oil:	200-mesh filter	None
	Ti	+0.22		Centrifuge	1.00 ml/25
	Ag	+0.24			
	Steel	+0.28	Tube deposits:	Below oil level	Lt carbon
	Cu	+0.22		At and above oil level	Lt carbon
	Mg	+0.23			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Med carbon	
Ti	Med carbon	Sample temperature, °F
Ag	Med carbon	Sample volume, ml
Steel	Med carbon	Air rate, liter/hr
Cu	Med carbon	Condensate return
Mg	Med carbon	No

TABLE 18. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 390°F

<u>Sample Data</u>						<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.17	0.11	--				
16 hr	13.7	3.52	0.77	39.5				
24 hr	14.28	3.49	0.76	57.3				
40 hr	15.73	3.75	1.17	88.8				
48 hr	18.31,	3.98	1.65	99.5	58	1.94	11.35	
6.01(a)	32.0(a)							
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>						
Weight change, mg/cm ² :		Al	+0.45	Sludge in oil:	200-mesh filter	None		
		Ti	+0.36		Centrifuge	1.95 ml/25		
		Ag	+0.18					
		Steel	+0.26	Tube deposits:	Below oil level	Lt carbon		
		Cu	+0.24		At and above oil level	Lt carbon		
		Mg	+0.30					
<u>Metal discoloration, deposits, bitting, or etching:</u>		<u>Test Conditions</u>						
		Med carbon						
	Al	Med carbon		Sample temperature, °F		390		
	Ti	Med carbon		Sample volume, ml		200		
	Ag	Med carbon		Air rate, liter/hr		130		
	Steel	Med carbon		Condensate return		No		
	Cu	Med carbon						
	Mg	Med carbon						

(a) Value obtained after centrifuging sample.

TABLE 19. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 390°F

Sample Date

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.68	12.8	3.42	0.74	37.2			
24 hr	13.87	14.5	3.49	0.91	54.8			
40 hr	14.96	23.3	3.73	1.20	86.6			
48 hr	15.91	31.2	3.69	1.64	99.1	55	2.73	11.23

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.10	Sludge in oil:	200-mesh filter	None
	Ti	+0.10		Centrifuge	1.00 ml/25
	Ag	+0.14			
	Steel	+0.12	Tube deposits:	Below oil level	Lt carbon
	Cu	+0.10		At and above oil level	Lt carbon
	Mg	+0.12			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon				390°F
Ti	Lt carbon				200
Ag	Lt carbon				130
Steel	Lt carbon				No
Cu	Lt carbon				
Mg	Lt carbon				

TABLE 20. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.78	13.6	3.51	1.02	46.1			
24 hr	13.97	15.2	3.53	1.14	67.6			
40 hr	16.61	36.9	4.03	2.09	104.2			
48 hr	(a)	--	(a)	(a)	114.8	66	2.99	11.48

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.67	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.53		Centrifuge	(a)
	Ag	+0.45			
	Steel	+0.61	Tube deposits:	Below oil level	Med carbon
	Cu	+0.08		At and above oil level	Med carbon
	Mg	+0.57			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon		
Ti	Lt carbon	Sample temperature, °F	400
Ag	Lt carbon	Sample volume, ml	200
Steel	Lt carbon	Air rate, liter/hr	130
Cu	Lt carbon	Condensate return	No
Mg	Lt carbon		

(a) Insufficient sample.

TABLE 21. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-60-18 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.13	--	3.17	0.19	--			
16 hr	13.80	13.8	3.45	0.98	46.8			
24 hr	14.45	19.1	3.64	1.20	67.4			
40 hr	16.91	39.4	3.83	1.86	103.3			
48 hr	(a)	--	(a)	(a)	113.0	67	3.09	11.49

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	(a)
	Ti		Centrifuge	(a)
	Ag	Tube deposits: Below oil level Med carbon		
	Steel			
	Cu			
	Mg	At and above oil level Med carbon		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon	Sample temperature, °F	400
Ti	Lt carbon	Sample volume, ml	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Lt carbon	Condensate return	No
Cu	Lt carbon		
Mg	Lt carbon		

(a) Insufficient sample.

(b) Weight error suspected.

TABLE 22. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-61-11 at 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	16.51	5.4	4.29	0.82	14.3			
24 hr	16.98	8.4	4.38	0.85	20.5			
40 hr	17.92	14.4	4.58	0.84	32.7			
48 hr	18.68	19.2	4.79	0.83	38.2	28	1.90	10.63

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.10	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	+0.18			
	Steel	+0.06	Tube deposits:	Below oil level	None
	Cu	+0.16		At and above oil level	None
	Mg	+0.16			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Brown		Sample temperature, °F	350
Ti	Lt blue		Sample volume, ml	200
Ag	Brown		Air rate, liter/hr	130
Steel	Lt brown		Condensate return	No
Cu	Dark brown			
Mg	Brown			

TABLE 23. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 375°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.11	0.39	--			
16 hr (a)	8.0	4.52	0.90	24.7			
24 hr	13.0	4.56	0.90	36.3			
40 hr	29.1	5.14	0.76	57.9			
48 hr	44.2	5.63	0.85	66.7	43	2.05	10.77
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Sludge in oil: 200-mesh filter					
		Centrifuge					
		None					
Metal discoloration, deposits, pitting, or etching:		Tube deposits: Below oil level					
		At and above oil level					
		Lt var					
		Lt var					
<u>Test Conditions</u>							
Brown		Sample temperature, °F					
Lt blue		Sample volume, ml					
Lt carbon		Air rate, liter/hr					
Peacock		Condensate return					
Lt carbon		No					
Hvy varnish							

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 24. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.54	11.9	4.50	0.87	38.0			
24 hr	18.85	20.3	4.80	0.89	55.1			
40 hr	24.34	55.3	5.99	0.89	82.0			
48 hr	34.21	118	8.19	1.38	90.5	54	2.03	11.08

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.06		Centrifuge	Trace
	Ag	+0.24			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	+0.26		At and above oil level	Lt var
	Mg	+0.12			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	
Ti	Lt green	Sample temperature, °F 385
Ag	Brown	Sample volume, ml 200
Steel	Green-red	Air rate, liter/hr 130
Cu	Lt carbon	Condensate return No
Mg	Brown	

TABLE 25. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-61-11 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/10°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.38	10.9	4.47	0.91	35.2			
24 hr	18.50	18.1	4.75	0.91	51.2			
40 hr	22.9	46.3	5.70	0.91	78.7			
48 hr	29.59	88.4	7.09	1.17	88.8	60	2.29	10.98

Metal Specimen Data

<u>Test Cell Data</u>	
Weight change, mg/cm ² :	
Al	+0.08
Ti	+0.02
Ag	+0.02
Steel	+0.47
Cu	+0.26
Mg	+0.12
Sludge in oil: 200-mesh filter	
	Centrifuge
Tube deposits: Below oil level	
	At and above oil level
	Lt var
	Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	Sample temperature, °F	385
Ti	Lt green	Sample volume, ml	200
Ag	Brown	Air rate, liter/hr	130
Steel	Lt green	Condensate return	No
Cu	Lt carbon		
Mg	Lt carbon		

TABLE 26. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.67	12.8	4.53	0.91	42.5			
24 hr	19.18	22.4	4.85	0.98	61.0			
40 hr	26.25	67.5	6.41	1.13	91.6			
48 hr	42.51	171	9.81	1.79	100.6	62	2.05	11.25

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	(a)
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	Sample temperature, °F	390
Ti	Lt blue	Sample volume, ml	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Red-purple	Condensate return	No
Cu	Lt carbon		
Mg	Brown		

(a) Insufficient sample.

TABLE 27. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.67	--	4.11	0.39	--			
16 hr	17.53	11.9	4.50	0.96	39.7			
24 hr	18.89	20.5	4.79	0.99	57.0			
40 hr	25.20	60.8	6.12	1.09	86.9			
48 hr	36.89	135	8.72	1.59	96.5	60	2.40	11.20

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	Nore
	Ti		Centrifuge	(a)
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,

pitting, or etching:

Test Conditions

Al	Lt brown
Ti	Lt blue
Ag	Brown
Steel	Blue-red
Cu	Lt carbon
Mg	Lt brown

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Insufficient sample.

TABLE 28. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-61-11 AT 400°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	15.67	--	4.11	0.39	--				
16 hr	17.73	13.1	4.57	1.06	47.9				
24 hr	19.44	24.1	4.49	1.14	68.9				
40 hr	28.56	82.2	6.93	1.71	103.0				
48 hr	(a)	--	(a)	(a)	111.8	68	2.46		11.37
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :		Al	+0.20	Sludge in oil: 200-mesh filter			(a)		
		Ti	0.0	Centrifuge			(a)		
		Ag	+0.28						
		Steel	0.0	Tube deposits: Below oil level			Lt var		
		Cu	+0.34	At and above oil level			Lt var		
		Mg	+0.20						
Test Conditions									
Metal discoloration, deposits, pitting, or etching:		Al	Lt brown	Sample temperature, °F			400		
		Ti	Lt blue	Sample volume, ml			200		
		Ag	Lt carbon	Air rate, liter/hr			130		
		Steel	Peacock	Condensate return			No		
		Cu	Lt carbon						
		Mg	Brown						

(a) Insufficient sample.

TABLE 29. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	16.63	7.2	4.03	0.27	12.7			
24 hr	17.18	10.8	4.12	0.36	17.9			
40 hr	18.57	19.7	4.38	0.44	26.7			
48 hr	19.48	25.6	4.54	0.52	30.6	23	1.14	8.79

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	None
	Ag	0.0			
	Steel	+0.06	Tube deposits:	Below oil level	None
	Cu	-0.08		At and above oil level	None
	Mg	+0.10			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	350
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Lt brown	Condensate return	No
Cu	Lt tan		
Mg	NC		

TABLE 30. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr (a)	16.85	8.6	4.05	0.48	9.5			
24 hr	17.78	14.6	4.22	0.57	18.8			
40 hr	20.68	33.3	4.70	0.69	37.0			
48 hr	22.87	47.5	5.06	0.86	43.3	34	1.38	8.97

Metal Specimen Data

Weight change, mg/cm ² :		Sludge in oil:	
Al	-0.02	200-mesh filter	None
Ti	-0.04	Centrifuge	None
Ag	+0.08		
Steel	+0.08	Tube deposits:	Below oil level
Cu	-0.14		At and above oil level
Mg	0.0		None

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Lt brown
Ag	Lt yellow
Steel	Blue
Cu	Brown
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 31. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt, %	Overhead Sample Acidity, mg KOH/g	S, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	17.46	12.6	4.15	0.58	18.6			
24 hr	18.95	22.2	4.40	0.67	32.5			
40 hr	23.40	50.9	5.42	0.94	52.9			
48 hr	26.72	72.3	5.64	1.21	57.6	42	1.62	9.09

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	None
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.18		At and above oil level	Lt var
	Mg	+0.04			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	
Ti	Brown	Sample temperature, °F
Ag	Lt yellow	Sample volume, ml
Steel	Blue	Air rate, liter/hr
Cu	Brown	Condensate return
Mg	NC	
		385
		200
		130
		NC

TABLE 32. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

<u>Sample Data</u>		Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/120°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial		15.51	--	3.84	0.02	
16 hr		17.54	13.1	4.16	0.53	
24 hr		18.91	21.9	4.32	0.65	
40 hr		23.26	50.0	5.10	0.91	
48 hr		26.15	68.6	5.59	1.08	43
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.10	Sludge in oil:	200-mesh filter	None
		Ti	+0.10		Centrifuge	Trace
		Ag	0.0	Tube deposits:	Below oil level	None
		Steel	+0.02		At and above oil level	None
		Cu	0.0			
		Mg	+0.06			
Metal discoloration, deposits, pitting, or etching:		Al	Lt brown	<u>Test Conditions</u>		
		Ti	Brown	Sample temperature, °F	385	
		Ag	Yellow	Sample volume, ml	200	
		Steel	Blue	Air rate, liter/hr	130	
		Cu	Purple	Condensate return	Yes	
		Mg	Lt yellow			

TABLE 33. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 385°F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., Mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	15.51	--	3.84	0.02	
16 hr	17.61	13.5	4.18	0.58	
24 hr	19.15	24.0	4.45	0.63	
40 hr	23.57	51.9	5.14	0.91	
48 hr	26.83	73.0	5.65	1.12	43

Metal Specimen Data

<u>Weight change, mg/cm²:</u>	<u>Al</u>	<u>0.0</u>	<u>Sludge in oil:</u>	<u>200-mesh filter</u>	<u>None</u>
	Ti	+0.02		Centrifuge	None
	Ag	+0.02			
	Steel	+0.04			
	Cu	-0.14			
	Mg	+0.04			
			<u>Tube deposits:</u>	<u>Below oil level</u>	<u>None</u>
				<u>At and above oil level</u>	<u>Lt var</u>

Metal discoloration, deposits,
pitting, or etching:

<u>Al</u>	<u>Lt yellow</u>
<u>Ti</u>	<u>Brown</u>
<u>Ag</u>	<u>Yellow</u>
<u>Steel</u>	<u>Blue</u>
<u>Cu</u>	<u>Blue-brown</u>
<u>Mg</u>	<u>Lt yellow</u>

Test Conditions

<u>Sample temperature, °F</u>	<u>385</u>
<u>Sample volume, ml</u>	<u>200</u>
<u>Air rate, liter/hr</u>	<u>130</u>
<u>Condensate return</u>	<u>Yes</u>

TABLE 34. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 390°F

Sample Data

	Vis, cs/100°F	100, F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	17.71	14.2	4.20	0.60	19.0			
24 hr	19.60	26.4	4.49	0.73	35.2			
40 hr	25.15	62.2	5.36	1.17	55.9			
48 hr	28.73	85.2	5.89	1.63	59.7	46	2.13	9.23

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	None
	Ag	+0.02	Tube deposits: Below oil level Lt var At and above oil level Lt var		
	Steel	+0.02			
	Cu	-0.20			
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	390
Ti	Brown	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Blue	Condensate return	No
Cu	Blue-red		
Mg	Lt yellow		

TABLE 35. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 390°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %		Vis, cs/210°F		Neut. No., mg KOH/g		Overhead Sample	
						Wt, g		Acidity, mg KOH/g	
						Oil Loss, wt %		Vis, cs/100°F	
Initial	15.51	--		3.84	0.02	--			
16 hr	18.06	16.4		4.27	0.59	33.5			
24 hr	19.92	28.4		4.55	0.79	50.1			
40 hr	25.42	63.9		5.35	1.03	71.7			
48 hr	29.03	87.2		5.93	1.19	77.0	48	2.05	11.25
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter		None	
		Ti	-0.02			Centrifuge		None	
		Ag	0.0						
		Steel	0.0			Tube deposits:		Below oil level	
		Cu	-0.22					At and above oil level	
		Mg	+0.02					Lt var	
Test Conditions									
Metal discoloration, deposits, pitting, or etching:				Sample temperature, °F					
				Sample volume, ml					
				Air rate, liter/hr					
				Condensate return					
				No					

TABLE 36. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.51	--	3.84	0.02	--			
16 hr	18.73	20.8	4.38	0.73	41.4			
24 hr	21.08	35.9	4.74	1.03	58.8			
40 hr	47.15	204	7.71	10.01	81.3			
48 hr	107.1	590	13.75	12.84	83.4	54	5.27	9.19

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.12	Sludge in oil:	200-mesh filter	None
	Ti	+0.08		Centrifuge	None
	Ag	-0.04			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.40		At and above oil level	None
	Mg	-0.22			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Blue
Ag	NC
Steel	Green
Cu	Slight etching
Mg	Slight etching

Test Conditions

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 37. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-3 AT 400°F

Sample Data								Overhead Sample	
Vis, cs/190°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	---	3.94	0.02	---					
16 hr	20.4	4.35	0.84	42.7					
24 hr	36.9	4.74	1.00	61.4					
40 hr	86.7	5.82	2.55	83.0					
48 hr	184	7.63	7.27	86.3	52	2.34	9.21		
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter					
Al				Centrifuge					
Ti				None					
Ag				Trace					
Steel				None					
Cu				None					
Mg				None					
				Tube deposits: Below oil level					
				At and above oil level					
				None					
				None					
Metal discoloration, deposits, pitting, or etching.				Test Conditions					
Al				Sample temperature, °F					
Ti				Sample volume, ml					
Ag				Air rate, liter/hr					
Steel				Condensate return					
Cu				No					
Mg				No					

(a) Weight error suspected.

TABLE 38. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.01	--	3.93	0.11	--			
16 hr	15.78	5.1	4.10	0.61	14.6			
24 hr	16.03	6.8	4.14	0.63	21.0			
40 hr	16.91	12.7	4.35	0.56	34.3			
48 hr	17.51	16.7	4.49	0.62	40.2	27	1.39	10.65

Metal Specimen Data

		<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifug.
	Ag		
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		None
			0.10 ml/25

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F	350
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Red-brown	Condensate return	Nc
Cu	Lt brown		
Mg	NC		

TABLE 39. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 375°F

Sample Data		Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.93	0.11	--			
16 hr (a)	7.2	4.15	0.84	24.1			
24 hr	11.6	4.29	0.82	35.7			
40 hr	25.3	4.78	0.95	55.4			
48 hr	43.3	5.37	1.23	68.4	42	1.66	10.85
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	Sludge in oil:		200-mesh filter	None	
	Ti	+0.02			Centrifuge	0.40 ml/25	
	Ag	-0.06					
	Steel	-0.02			Tube deposits:	Below oil level	None
	Cu	-0.04				At and above oil level	Lt var
	Mg	0.08					
		+0.06					
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
	Al	Tan	Sample temperature, °F		375		
	Ti	Lt brown	Sample volume, ml		200		
	Ag	Lt yellow	Air rate, liter/hr		130		
	Steel	Blue	Condensate return		No		
	Cu	Lt brown					
	Mg	NC					

(a) A gradual 5°F drop in bath temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 40. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

Sample Data									
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	15.01	--	3.93	0.11	--				
16 hr	16.48	9.8	4.24	0.88	34.9				
24 hr	17.41	16.0	4.17	0.82	51.9				
40 hr	21.73	44.8	4.52	0.99	84.1				
48 hr	30.22	101	7.55	1.45	96.6	58	1.68	11.06	
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter	None		
		Ti	+0.02			Centrifuge	(a)		
		Ag	+0.04						
		Steel	+0.06			Tube deposits:	Below oil level	Lt var	
		Cu	-0.04				At and above oil level	Lt var	
		Mg	+0.02						
Test Conditions									
Metal discoloration, deposits, pitting, or etching:			Pink	Sample temperature, °F			385		
		Al	Pink	Sample volume, ml			700		
		Ti	Lt pink	Air rate, liter/hr			130		
		Ag	Green	Condensate return			No		
		Steel	Orange						
		Cu	Tan						
		Mg							

(a) Insufficient sample.

TABLE 41. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

<u>Sample Data</u>							<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	15.01	--	0.11	--				
16 hr	16.46	3.93	0.84	34.2				
24 hr	17.33	4.26	0.90	50.5				
40 hr	21.78	4.45	1.26	81.1				
48 hr	32.04	5.43	1.95	92.5	55	1.69	10.98	
		7.63						
		1.3						
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>						
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:		200-mesh filter	None	
		Ti	+0.02			Centrifuge	(a)	
		Ag	+0.06					
		Steel	+0.06	Tube deposits:		Below oil level	Lt var	
		Cu	-0.02			At and above oil level	Lt var	
		Mg	0.0					

(a) Insufficient sample.

TABLE 42. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 385°F

<u>Sample Data</u>							
	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>		
Initial	15.01	--	3.93	0.39			
16 hr	16.43	9.5	4.24	0.86			
24 hr	17.29	15.2	4.37	0.86			
40 hr	20.80	38.6	5.23	0.91			
48 hr	26.93	79.4	6.56	1.14	54		
<u>Metal Specimen Data</u>							
<u>Test Cell Data</u>							
Weight change, mg/cm ² :		Al	Sludge in oil:		200-mesh filter	None	
		Ti			Centrifuge	Trace	
		Ag					
		Steel			Tube deposits:	Below oil level	Med var
		Cu			At and above oil	level	Lt carbon
		Mg					
<u>Test Conditions</u>							
Metal discoloration, deposits, pitting, or etching:		Al	Sample temperature, °F			385	
		Ti	Sample volume, ml			200	
		Ag	Air rate, liter/hr			130	
		Steel	Condensate return			Yes	
		Cu					
		Mg					

TABLE 43. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.01	--	3.93	0.11	--			
16 hr	16.70	11.3	4.20	0.81	39.3			
24 hr	17.80	18.6	4.54	1.05	57.7			
40 hr	24.09	60.5	5.91	1.19	91.3			
48 hr	51.19	241	11.39	2.22	103.6	62	1.78	11.13

Metal Specimen Data

Weight change, mg/cm ² :	Al	Ti	Ag	Steel	Cu	Mg
	0.0	-0.02	+0.02	+0.04	-0.08	+0.04
Sludge in oil:	200-mesh filter					
	Centrifuge					
Tube deposits:	Below oil level					
	At and above oil level					
	Lt var					
	Lt var					

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt purple	Sample temperature, °F	390
Ti	Brown	Sample volume, ml	200
Ag	Lt pink	Air rate, liter/hr	130
Steel	Green	Condensate return	No
Cu	Pink-brown		
Mg	Lt yellow		

(a) Inadequate sample.

TABLE 44. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-4 AT 400°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.93	0.11	--			
16 hr	11.7	4.38	1.03	45.7			
24 hr	20.6	4.63	1.14	67.6			
40 hr	128	8.00	2.49	105.6			
48 hr	--	(a)	(a)	106.8	64	1.94	11.27
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti				0.0			
Ag				+0.02			
Steel				0.0			
Cu				+0.02			
Mg				-0.34			
				+0.06			
Metal discoloration, deposits, pitting, or etching:				Tube deposits: Below oil level Med var			
Al				At and above oil level Med var			
Ti							
Ag							
Steel							
Cu							
Mg							
Test Conditions							
Lt pink							
Lt brown				Sample temperature, °F			
Lt yellow				Sample volume, ml			
Green				Air rate, liter/hr			
Slight pitting				Condensate return			
NC							

(a) Insufficient sample.

TABLE 45. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 350°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.79	--	4.70	0.24	--			
16 hr	18.58	4.4	4.86	0.53	15.0			
24 hr	19.17	7.8	5.01	0.55	21.9			
40 hr	20.68	16.2	5.31	0.56	35.3			
48 hr	21.87	22.9	5.61	0.58	41.4	28	1.54	10.54

Metal Specimen Data

Weight change, mg/cm ² :		Sludge in oil:	
Al	+0.04	200-mesh filter	None
Ti	-0.02	Centrifuge	None
Ag	-0.04		
Steel	+0.04	Tube deposits:	Below oil level
Cu	0.0		At and above oil level
Mg	0.0		None

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F	350
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Dark blue	Condensate return	No
Cu	Lt green		
Mg	NC		

TABLE 46. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-62-6 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt g	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.79	--	4.70	0.24	--			
16 hr (a)	19.18	7.8	4.97	0.66	25.0			
24 hr	20.48	15.1	5.27	0.70	37.3			
40 hr	24.57	38.1	6.20	0.77	60.8			
48 hr	29.65	66.7	7.32	0.90	70.7	42	1.67	10.69

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	-0.14		Centrifuge	None
	Ag	0.0			
	Steel	-0.02	Tube deposits:	Below oil level	None
	Cu	+0.18		At and above oil level	Lt var
	Mg	+0.04			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Grey	Sample temperature, °F	375
Ti	Brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	No
Cu	Yellow-green		
Mg	NC		

(a) A gradual 5°F drop in sample temperature occurred during the test period of approximately 4 to 16 hr.

TABLE 47. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data

	<u>Vis, cs/100° F</u>	<u>100° F Vis Increase, %</u>	<u>Vis, cs/210° F</u>	<u>Neut. No., mg KOH/g</u>	<u>Overhead Wt, g</u>	<u>Oil Loss, wt %</u>	<u>Overhead Sample Acidity, mg KOH/g</u>	<u>Vis, cs/100° F</u>
Initial	17.79	--	4.70	0.24	--			
16 hr	17.99	1.1	5.07	0.75	33.6			
24 hr	21.12	18.7	5.42	0.82	49.2			
40 hr	26.21	47.3	6.49	1.25	78.3			
48 hr	38.79	118	7.43	22.4	82.9	57	2.68	10.67

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	Trace
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.25		At and above oil level	Lt var
	Mg	+0.10			

Metal discoloration, deposits,
pitting, or etching: Al

Al	NC		
Ti	Blue	Sample temperature, °F	385
Ag	NC	Sample volume, ml	200
Steel	Lt green	Air rate, liter/hr	130
Cu	Slight etching	Condensate return	No
Mg	Lt yellow		

TABLE 48. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.70	0.24	--			
16 hr	12.3	5.15	0.74	37.0			
24 hr	22.3	5.58	0.79	54.0			
40 hr	64.6	7.19	1.19	84.0			
48 hr	119	9.12	2.06	94.0	57	2.41	10.94
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	None	
		Ti	-0.02		Centrifuge	Trace	
		Ag	+0.06				
		Steel	0.0	Tube deposits:	Below oil level	Lt var	
		Cu	-0.14		At and above oil level	Lt var	
		Mg	-0.04				
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
Al	Lt purple	Sample temperature, °F	385				
Ti	Dark purple	Sample volume, ml	200				
Ag	Tan	Air rate, liter/hr	130				
Steel	Blue-green	Condensate return	No				
Cu	Yellow-green						
Mg	Lt yellow-green						

TABLE 49. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data														
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g Vis, cs/100°F							
Initial	17.79	--	4.70	0.24	--									
16 hr	20.02	12.5	5.15	0.86	36.6									
24 hr	21.89	23.0	5.57	0.34	53.5									
40 hr	28.96	62.8	7.19	1.18	83.1									
48 hr	40.68	129	9.59	1.78	93.0	58	2.02		11.01					
Metal Specimen Data					Test Cell Data									
Weight change, mg/cm ² :					Al	-0.02	Sludge in oil:		200-mesh filter	None				
					Ti	-0.02			Centrifuge	Trace				
					Ag	+0.06								
					Steel	0.	Tube deposits:		Below oil level	Lt var				
					Cu	-0.10			At and above oil level	Lt var				
					Mg	+0.02								
Metal discoloration, deposits, pitting, or etching:										Test Conditions				
Al					Lt pink		Sample temperature, °F			385				
Ti					Purple		Sample volume, ml			200				
Ag					NC		Air rate, liter/hr			130				
Steel					Green		Condensate return			No				
Cu					Lt yellow									
Mg					Lt yellow									

TABLE 50. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		17.79	--	4.70	0.24	
16 hr		19.74	11.0	5.10	0.87	
24 hr		21.36	20.1	5.46	0.88	
40 hr		27.25	53.2	6.77	1.09	
48 hr		28.1	58.0	6.56	5.01	54
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	+0.02		Centrifuge	Trace
		Ag	0.0			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	-0.12		At and above oil	
		Mg	+0.04		level	Lt carbon
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	NC				
	Ti	Lt red-blue				
	Ag	Lt yellow				
	Steel	Blue				
	Cu	Yellow-brown				
	Mg	Lt yellow-green				
		Sample temperature, °F				385
		Sample volume, ml				200
		Air rate, liter/hr				130
		Condensate return				Yes

TABLE 51. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 385°F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	17.79	--	4.70	0.24	
16 hr	19.65	10.5	5.08	0.79	
24 hr	21.26	19.5	5.43	0.82	
40 hr	26.77	50.5	6.63	1.13	
48 hr	26.53	49.1	5.91	10.78	54

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.20		At and above oil	
	Mg	+0.04		level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Blue-green	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Peacock	Condensate return	Yes
Cu	Yellow-orange		
Mg	Lt yellow		

TABLE 52. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 390°F

Sample Data		Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.70	0.24	--			
16 hr	12.8	5.10	0.89	40.5			
24 hr	23.0	5.51	0.91	59.1			
40 hr	144	7.89	27.9	100			
48 hr	--	(a)	36.2	108.5	66	7.12	10.52
Metal Specimen Data							
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:		200-mesh filter	(a)
		Ti	-0.02			Centrifuge	(a)
		Ag	+0.04				
		Steel	+0.02	Tube deposits:		Below oil level	Lt var
		Cu	-1.20			At and above oil level	Lt var
		Mg	+0.04				
Metal discoloration, deposits, pitting, or etching:							
		Al	Lt green			Sample temperature, °F	390
		Ti	Lt blue			Sample volume, ml	200
		Ag	NC			Air rate, liter/hr	130
		Steel	Lt brown			Condensate return	No
		Cu	Severe pitting				
		Mg	Lt yellow				

(a) Sample gelled.

TABLE 53. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 390°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	17.79	--	4.70	0.24	--				
16 hr	20.07	12.8	5.17	0.79	40.7				
24 hr	22.03	23.8	5.55	0.91	59.7				
40 hr	54.68	207	9.50	27.7	101.5				
48 hr	(a)	--	(a)	30.9	108.0	69	9.85		10.64
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :					Sludge in oil:		200-mesh filter	(a)	
Al				+0.02			Centrifuge	(.)	
Ti				+0.04					
Ag				0.0					
Steel				+0.04			Tube deposits:	Below oil level	Lt var
Cu				-3.96				At and above oil level	Lt var
Mg				+0.02					
Test Conditions									
Metal discoloration, deposits, pitting, or etching:									
Al				NC					
Ti				Lt blue					Sample temperature, °F 390
Ag				Lt yellow					Sample volume, ml 200
Steel				Yellow-purple					Air rate, liter/hr 130
Cu				Severe etching					Condensate return No
Mg				Yellow					

(a) Sample gelled.

TABLE 54. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-6 AT 400°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.70	0.24	--			
16 hr	12.3	4.80	1.00	47.4			
24 hr	32.4	5.10	20.5	74.9			
40 hr	--	(a)	37.9	110.8			
48 hr	--	--	--	--	69	1.94	11.27
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag							
Steel				Tube deposits: Below oil level			
Cu				At and above oil level			
Mg							
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				NC			
Ti				Lt brown			
Ag				NC			
Steel				Green			
Cu				Severe etching			
Mg				Slight pitting			
				Sample temperature, °F			
				Sample volume, ml			
				Air rate, liter/hr			
				Condensate return			

(a) Test terminated at 40 hr, sample gelled.

TABLE 55. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-7 AT 390°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.19	0.01	--			
16 hr	15.7	4.60	0.38	24.5			
24 hr	22.2	4.77	0.51	31.0			
40 hr	32.6	5.01	0.68	43.6			
48 hr	144	6.98	9.01	49.8	33	7.87	9.02
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	None	
		Ti	+0.02		Centrifuge	None	
		Ag	-0.08	Tube deposits:		None	
		Steel	-0.02		Below oil level	None	
		Cu	-0.20		At and above oil level	Lt carbon	
		Mg	-0.06				
<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>					
		Al	Lt yellow	Sample temperature, °F			390
		Ti	Brown	Sample volume, ml			200
		Ag	Lt yellow	Air rate, liter/hr			130
		Steel	Blue-green	Condensate return			No
		Cu	Slight pitting				
		Mg	Lt yellow				

TABLE 56. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.39	8.7	4.59	0.70	29.9			
24 hr	18.41	15.1	4.75	0.82	43.3			
40 hr	22.02	37.6	5.57	0.89	69.1			
48 hr	26.62	66.4	6.58	1.03	79.0	48	1.64	10.62

Metal Specimen Data

Weight change, mg/cm ² :	Al
	Ti
	Ag
	Steel
	Cu
	Mg

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt blue
Ag	NC
Steel	Blue
Cu	Yellow-brown
Mg	Lt yellow

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 57 RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.80	11.2	4.60	0.76	38.2			
24 hr	19.24	20.2	4.94	0.79	54.7			
40 hr	25.36	58.5	6.25	1.10	83.8			
48 hr	38.97	144	9.11	1.54	93.0	57	1.91	10.83

Metal Specimen Data

Weight change, mg/cm ² :		Test Cell Data	
Al	0.0	Sludge in oil:	200-mesh filter
Ti	+0.02		Centrifuge
Ag	-0.02		
Steel	0.0	Tube deposits:	Below oil level
Cu	-0.16		At and above oil level
Mg	+0.04		Lt var
			Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions	
Al	NC
Ti	Lt blue
Ag	Tan
Steel	Blue
Cu	Gold
Mg	Lt yellow
Sample temperature, °F	
385	
Sample volume, ml	
200	
Air rate, liter/hr	
130	
Condensate return	
No	

TABLE 58. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	18.03	12.9	4.64	0.82	42.8			
24 hr	19.71	20.0	5.02	0.91	62.6			
40 hr	27.70	73.4	6.68	1.86	96.1			
48 hr	68.25	327	14.41	3.17	105.2	63	2.30	11.00

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	(a)
	Ag	+0.02			
	Steel	-0.08	Tube deposits:	Below oil level	None
	Cu	-0.16		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	390
Ti	Lt blue	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Yellow		
Mg	Lt yellow		

(a) Insufficient sample.

TABLE 59. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-13 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.00	--	4.24	0.25	--			
16 hr	17.95	12.2	4.63	1.02	49.4			
24 hr	21.55	34.7	4.80	17.86	76.9			
40 hr	(a)	--	(a)	25.2	109.9			
48 hr	--	--	--	--	--	68	14.56	10.55

Metal Specimen Data

<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Sludge in oil: 200-mesh filter (a)
Al	Centrifuge (a)
Ti	
Ag	
Steel	Tube deposits: Below oil level Hvy var
Cu	At and above oil level Med var
Mg	

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	Lt blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Lt yellow	Condensate return	No
Cu	Severe etching		
Mg	Slight pitting		

(a) Test terminated at 40 hr, sample gelled.

TABLE 60. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 375°F

Sample Data				Test Cell Data				Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KCH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	--	4.45	0.22						
16 hr	8.3	4.74	0.71	28.0					
24 hr	14.4	4.98	0.80	40.6					
40 hr	35.2	5.76	0.86	65.4					
48 hr	57.2	6.59	0.99	75.6	44	1.69	10.33		
Metal Specimen Data									
Weight change, mg/cm ² :				Sludge in oil:		200-mesh filter		None	
						Centrifuge		Trace	
				Tube deposits:		Below oil level		Lt var	
						At and above oil level		Lt var	
Metal discoloration, deposits, pitting, or etching:				Test Conditions					
				Al		NC		Sample temperature, °F	
				Ti		Lt blue		375	
				Ag		NC		Sample volume, ml	
				Steel		Blue		200	
				Cu		Lt yellow		Air rate, liter/hr	
				Mg		Lt yellow		130	
								Condensate return	
								No	

TABLE 61. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 385°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt g	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.45	0.22	--			
16 hr	11.8	4.85	0.76	38.0			
24 hr	20.6	5.18	0.82	53.9			
40 hr	25.69	6.31	1.10	82.8			
48 hr	28.58	6.11	13.96	94.3	57	1.37	10.80
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
				Centrifuge			
				Tube deposits: Below oil level			
				At and above oil level			
				None			
				Trace			
				Lt var			
				Lt var			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg							

TABLE 62. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		16.84	--	4.45	0.22	
16 hr		18.54	10.1	4.78	0.80	
24 hr		19.83	17.8	5.07	0.81	
40 hr		23.89	41.9	6.01	1.20	
48 hr		35.35	110	6.94	21.9	57
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	Trace
		Ag	-0.10	Tube deposits: Below oil level Lt var At and above oil level Lt var		
		Steel	+0.02			
		Cu	-0.59			
		Mg	+0.04			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	Lt blue	Sample temperature, °F	385		
	Ti	Blue-green	Sample volume, ml	200		
	Ag	NC	Air rate, liter/hr	130		
	Steel	Blue-green	Condensate return	Yes		
	Cu	Moderate pitting				
	Mg	Lt yellow				

TABLE 63. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 390°F

Sample Data						Overhead Sample	
Vis, ca/100°F	100°F Vis Increase, %	Vis, cc/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.45	0.22	--			
16 hr	11.8	4.86	0.80	38.5			
24 hr	21.3	5.24	0.93	55.9			
40 hr	173	8.32	29.6	95.1			
48 hr	(a)	(a)	34.3	100.2	66	5.95	10.63
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter	(a)
		Ti	+0.02			Centrifuge	(a)
		Ag	+0.02				
		Steel	+0.02	Tube deposits:		Below oil level	Lt var
		Cu	+0.99			At and above oil level	Lt var
		Mg	+0.06				
Metal discoloration, deposits, pitting, or etchings:		Test Conditions					
		Al	NC	Sample temperature, F°		390	
		Ti	Blue-yellow	Sample volume, ml		200	
		Ag	yellow	Air rate, liter/hr		130	
		Steel	Yellow-red	Condensate return		No	
		Cu	Severe etching				
		Mg	Yellow				

(a) Sample gelled.

TABLE 64. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 390°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	16.84	--	4.45	0.22	--				
16 hr	18.81	11.7	4.83	0.93	39.8				
24 hr	20.38	21.0	5.19	0.90	58.3				
40 hr	39.87	137	7.39	28.3	98.5				
48 hr	(a)	--	(a)	(a)	108.7	66	9.14		10.64
Metal Specimen Data					Test Cell Data				
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter (a)				
Al					Centrifuge (a)				
Ti									
Ag									
Steel									
Cu					Tube deposits: Below oil level				
Mg					At and above oil level				
					Lt var				
					Lt var				
Metal discoloration, deposits, pitting, or etching:									
Al					NC				
Ti					Lt green				
Ag					Lt yellow				
Steel					Yellow-red				
Cu					Severe etching				
Mg					Yellow				
					Sample temperature, °F 390				
					Sample volume, ml 200				
					Air rate, liter/hr 130				
					Condensate return No				

(a) Insufficient sample.

TABLE 65. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-62-16 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.45	0.22	--	--		
16 hr	18.71	11.1	4.82	1.02	46.8			
24 hr	25.05	48.8	5.25	23.2	76.2			
40 hr	(a)	--	(a)	40.1	111.4			
48 hr	--	--	--	--	--	69	19.87	10.54

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.14	Sludge in oil:	200-mesh filter	(a)
	Ti	0.0		Centrifuge	(a)
	Ag	+0.04	Tube deposits:	Below oil level	Hvy var
	Steel	+0.06		At and above oil	level
	Cu	-4.3			Med var
	Mg	-0.34			

Metal discoloration, deposits,
pitting, or etching:

Al	NC	Sample temperature, °F	400
Ti	Lt blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Lt blue	Condensate return	No
Cu	Severe etching		
Mg	Moderate pitting		

(a) Test terminated at 40 hr, sample gelled.

TABLE 66. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-1 AT 390°F

Sample Data									
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt%	Overhead Sample		
							Acidity, mg KOH/g	Vis, cs/100°F	
Initial	17.48	--	4.64	0.23	--				
16 hr	19.74	12.9	5.15	0.63	39.7				
24 hr	21.78	24.6	5.57	0.74	58.3				
40 hr	28.37	62.3	6.90	2.00	90.4				
48 hr	92.29	428	14.64	18.93	102.1	63	2.71	10.68	
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :									
Al				+0.04	Sludge in oil:		200-mesh filter	(a)	
Ti				+0.08			Centrifuge	(a)	
Ag				-0.06					
Steel				+0.12	Tube deposits:		Below oil level	Lt var	
Cu				-0.08			At and above oil level	None	
Mg				+0.22					
Metal discoloration, deposits, pitting, or etching:									
Al				NC	Sample temperature, °F		390		
Ti				Blue	Sample volume, ml		200		
Ag				Lt yellow	Air rate, liter/hr		130		
Steel				Blue-green	Condensate return		No		
Cu				Reddish-brown					
Mg				Yellow					

(a) Insufficient sample.

TABLE 67. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-2 AT 390°F

Sample Data		100°F Vis		Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
Vis, cs/100°F	Increase, %	Initial	16 hr					Acidity, mg KOH/g	Vis, cs/100°F
			--	4.31	0.22	--			
			11.5	4.70	0.62	38.2			
			21.5	5.05	0.72	56.0			
			58.1	6.32	1.26	86.8			
			94.5	6.84	11.58	97.8	61	2.19	10.92
Metal Specimen Data		Test Cell Data							
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:		200-mesh filter		None	
		Ti	+0.02			Centrifuge		(a)	
		Ag	0.0						
		Steel	0.0			Tube deposits:		Below oil level	
		Cu	+0.14					At and above oil level	
		Mg	+0.16					Lt var	
Metal discoloration, deposits, pitting, or etching:		Test Conditions							
		Al	Lt yellow		Sample temperature, °F		390		
		Ti	Brown		Sample volume, ml		200		
		Ag	Lt yellow		Air rate, liter/hr		130		
		Steel	Reddish-blue		Condensate return		No		
		Cu	Blue-brown						
		Mg	Dark grey						

(a) Insufficient sample.

TABLE 68. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-3 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.24	--	4.09	0.24	--			
16 hr	16.95	11.2	4.38	0.76	40.8			
24 hr	18.26	19.8	4.66	0.76	59.0			
40 hr	148.0	871	18.04	25.3	101.3			
48 hr	(a)	--	(a)	23.7	102.3	65	11.37	10.39

Metal Specimen Data

<u>Weight change, mg/cm²:</u>		<u>Test Cell Data</u>	
Al	+0.04	Sludge in oil:	200-mesh filter (a)
Ti	+0.06		Centrifuge (a)
Ag	-0.04		
Steel	+0.08	Tube deposits:	Below oil level Med var
Cu	-0.99		At and above oil level Med var
Mg	-12.60		

Metal discoloration, deposits,
pitting, or etching:

Al	NC	<u>Test Conditions</u>	
Ti	Blue	Sample temperature, °F	390
Ag	Lt yellow	Sample volume, ml	200
Steel	Blue-green	Air rate, liter/hr	130
Cu	Severe etching	Condensate return	No
Mg	Severe etching		

(a) Sample gelled.

TABLE 69. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-7 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt. g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.75	--	3.37	0.10	--			
16 hr	14.19	11.3	3.65	0.79	47.6			
24 hr	15.13	18.7	3.87	0.68	68.8			
40 hr	21.31	67.1	5.16	1.39	104.0			
48 hr	(a)	--	(a)	(a)	111.4	67	1.45	10.67

Metal Specimen Data

		<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter (a)
	Ti		Centrifuge (a)
	Ag	Tube deposits:	
	Steel		Below oil level Med var
	Cu		At and above oil level Med var
	Mg		

Metal discoloration, deposits,
pitting, or etching:

		<u>Test Conditions</u>	
Al	Lt yellow	Sample temperature, °F	390
Ti	Brown-red	Sample volume, ml	200
Ag	Brown-red	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Brown		
Mg	Brown-red		

(a) Insufficient sample.

TABLE 70. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.77	--	3.50	0.15	--			
16 hr	14.54	5.6	3.62	0.34	14.5			
24 hr	14.80	7.5	3.69	0.43	20.9			
40 hr	15.36	11.5	3.77	0.54	34.1			
48 hr	17.76	29.0	3.87	0.55	40.0	27	1.62	11.24

Metal Specimen Data

<u>Test Cell Data</u>		<u>Test Cell Data</u>	
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifuge
	Ag		
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		Lt var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	375
Ti	Lt brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	No
Cu	Red-brown		
Mg	Grey		

TABLE 71. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 385°F

Sample Data							
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Aleut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g
							Vis, cs/100°F
Initial	13.77	--	3.50	0.15	--		
16 hr	14.79	7.4	3.65	0.43	21.2		
24 hr	15.14	9.9	3.72	0.51	30.4		
40 hr	15.99	16.1	3.86	0.59	47.0		
48 hr	16.49	19.8	4.01	0.50	54.0	35	1.71
11.42							
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge 0.05ml/25			
Ti				None			
Ag				None			
Steel				Tube deposits: Below oil level			
Cu				At and above oil level			
Mg				Lt var			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg				No			

TABLE 72. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.77	--	3.50	0.15	--			
16 hr	14.80	7.5	3.67	0.45	23.3			
24 hr	15.13	9.9	3.78	0.55	34.0			
40 hr	16.16	17.4	3.92	0.61	53.6			
48 hr	17.09	24.1	4.09	0.63	66.2	39	1.88	11.38

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge	0.25 ml/25
	Ag	+0.02			
	Steel	-0.12	Tube deposits:	Below oil level	None
	Cu	-0.43		At and above oil level	Lt var
	Mg	-0.26			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	
Ti	Brown	Sample temperature, °F
Ag	Lt yellow	Sample volume, ml
Steel	Blue	Air rate, liter/hr
Cu	Mod etching	Condensate return
Mg	Brown	No

TABLE 73. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-8 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.50	0.15	--			
16 hr	7.9	3.69	0.52	29.6			
24 hr	11.8	3.78	0.62	43.1			
40 hr	23.8	4.07	0.73	67.2			
48 hr	37.0	4.41	0.88	76.4	47	2.03	11.44
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Al	+0.16	Sludge in oil:		200-mesh filter	None
		Ti	+0.08			Centrifuge	Trace
		Ag	+0.02				
		Steel	+0.08	Tube deposits:		Below oil level	None
		Cu	-0.49			At and above oil level	Lt var
		Mg	-0.08				
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
		Al	NC	Sample temperature, °F		400	
		Ti	Brown	Sample volume, ml		200	
		Ag	NC	Air rate, liter/hr		130	
		Steel	Lt blue	Condensate return		No	
		Cu	Slight pitting				
		Mg	Brown				

TABLE 74. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-63-8 AT 400°F

<u>Sample Data</u>						<u>Overhead Sample</u>	
Vis, cs/100°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.50	0.15	--			
16 hr	8.4	3.70	0.58	30.8			
24 hr	11.8	3.83	0.67	44.1			
40 hr	24.6	4.08	0.84	68.7			
48 hr	38.1	4.42	0.94	78.4	48	2.03	11.45
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:		200-mesh filter	None
		Ti	+0.08			Centrifuge	Trace
		Ag	0.0				
		Steel	+0.06	Tube deposits:		Below oil level	None
		Cu	-0.32			At and above oil level	Lt var
		Mg	-0.08				
Metal discoloration, deposits, pitting, or etching:		Al	Lt yellow	<u>Test Conditions</u>			
		Ti	Purple	Sample temperature, °F		400	
		Ag	NC	Sample volume, ml		200	
		Steel	Lt blue	Air rate, liter/hr		130	
		Cu	Slight pitting	Condensate return		No	
		Mg	Lt green				

TABLE 75. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-12 AT 390 °F

Sample Data						Overhead Sample	
Vis, cs/100 °F	100 °F Vis Increase, %	Vis, cs/210 °F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100 °F
Initial	--	3.91	0.23	--			
16 hr	9.0	4.16	0.47	29.7			
24 hr	13.7	4.32	0.63	43.8			
40 hr	33.1	4.93	0.68	70.8			
48 hr	61.6	5.79	0.91	82.0	48	1.63	11.64

Metal Specimen Data		Test Cell Data	
Weight change, mg/cm ² :		Sludge in oil: 200-mesh filter	
Al	+0.04	Centrifuge	
Ti	0.0		
Ag	0.0		
Steel	0.0	Tube deposits: Below oil level	
Cu	-0.32	At and above oil level	
Mg	-0.18	Lt var	
		None	

Metal discoloration, deposits, pitting, or etching:		Test Conditions	
Al	Lt blue	Sample temperature, °F	390
Ti	Blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Peacock	Condensate return	No
Cu	Mod pitting		
Mg	Orange		

(a) Insufficient sample.

TABLE 76. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt%	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.88	--	4.39	0.05	--			
16 hr	18.37	8.8	4.72	1.02	25.6			
24 hr	18.78	11.3	4.81	1.17	36.9			
40 hr	19.97	18.3	5.07	1.49	57.8			
48 hr	21.29	26.1	5.37	1.65	67.2	41	3.08	12.12

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.06
	Ti	0.0
	Ag	0.0
	Steel	+0.04
	Cu	-0.08
	Mg	-0.08

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Lt var
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Yellow-blue
Ag	Lt yellow
Steel	Brown-yellow
Cu	Brown
Mg	Lt yellow

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 77. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 385°F

<u>Sample Data</u>					<u>Overhead Sample</u>		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.34	0.29	--			
16 hr	15.4	4.92	0.65	37.7			
24 hr	29.3	5.36	0.65	54.3			
40 hr	82.7	7.26	0.93	81.6			
48 hr	170	10.24	1.14	89.1	56	1.75	9.90
<u>Metal Specimen Data</u>					<u>Test Cell Data</u>		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al						Centrifuge	Trace
Ti							
Ag							
Steel					Tube deposits:	Below oil level	Lt var
Cu						At and above oil level	Lt var
Mg							
<u>Metal discoloration, deposits, pitting, or etching:</u>					<u>Test Conditions</u>		
Al						Sample temperature, °F	385
Ti						Sample volume, ml	200
Ag						Air rate, liter/hr	130
Steel						Condensate return	No
Cu							
Mg							

TABLE 78. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	16.47	--	4.34	0.29	
16 hr	18.65	13.2	4.80	0.62	
24 hr	20.73	25.9	5.24	0.67	
40 hr	28.84	75.1	6.98	0.84	
48 hr	41.65	153	9.67	1.17	55

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	Trace
	Ag	-0.02			
	Steel	0.0	Tube deposits:	Below oil level	Lt var
	Cu	-0.04		At and above oil level	Lt var
	Mg	+0.02			

Test Conditions

Meta discoloration, deposits,
pitting, or etching:

Al	NC	Sample temperature, °F	385
Ti	Blue-red	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	Yes
Cu	Lt brown		
Mg	NC		

TABLE 79. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt, g	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.47	--	4.34	0.29	--		
16 hr	19.15	16.3	4.99	0.70	40.9		
24 hr	21.83	32.5	5.55	0.93	60.3		
40 hr	32.81	99.2	7.60	1.67	90.7		
48 hr	69.18	320	13.50	6.73	98.4	2.58	9.83

Metal Specimen Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	(a)
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	Lt var
	Mg			

Test Cell Data

Test Conditions

Metal discoloration, deposits, pitting, or etching:	Al	NC	Sample temperature, °F	390
	Ti	Yellow-blue	Sample volume, ml	200
	Ag	Lt pink	Air rate, liter/hr	130
	Steel	Pink-yellow	Condensate return	No
	Cu	Lt brown		
	Mg	Lt brown		

(a) Insufficient sample.

TABLE 80. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-63-16 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss Wt, g	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.47	--	4.34	0.29	--		
16 hr	19.45	18.1	4.94	0.89	47.9		
24 hr	21.61	31.2	5.31	1.48	70.4		
40 hr	(a)	--	(a)	30.3	111.1		
48 hr	--	--	--	--	--	11.63	9.78

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.30 (b)		Centrifuge	(a)
	Ag	+0.02	Tube deposits:	Below oil level	Lt var
	Steel	+0.06		At and above oil level	Lt var
	Cu	+0.04			
	Mg	-0.45			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Yellow
Ag	Yellow
Steel	Red-green
Cu	Brown
Mg	Lt carbon

Test Conditions

Sample temperature, °F	400
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Test terminated at 40 hr, sample gelled.

(b) Weight error suspected.

TABLE 81. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--			
16 hr	29.29	6.5	5.26	0.09	3.4			
24 hr	30.04	9.2	5.38	0.19	4.6			
40 hr	31.01	12.8	5.50	0.30	7.0			
43 hr	31.37	14.8	5.52	0.31	7.9	10	2.54	(a)

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.06		Centrifuge	None
	Ag	-0.04	Tube deposits:	Below oil level	None
	Steel	+0.02		At and above oil level	None
	Cu	0.0			
	Mg	0.0			

Test Cell Data

Test Conditions

Metal discoloration, deposits, pitting, or etching:	Al	NC	Sample temperature, °F	375
	Ti	NC	Sample volume, ml	200
	Ag	Lt yellow	Air rate, liter/hr	130
	Steel	Blue	Condensate return	No
	Cu	Rose		
	Mg	NC		

(a) Insufficient sample.

TABLE 82. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-64-2 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--	--	--	--
16 hr	29.54	7.4	5.35	0.19	4.5			
24 hr	30.64	11.4	5.45	0.25	6.1			
40 hr	31.48	14.5	5.61	0.33	8.9			
48 hr	32.65	18.7	5.72	0.38	10.1	15	3.33	21.54

Metal Specimen Data

Weight change, mg/cm ² :	Al	-0.06
	Ti	0.0
	Ag	+0.06
	Steel	+0.04
	Cu	-0.10
	Mg	+0.02

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	Lt yellow
Steel	Blue
Cu	Purple
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 83. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 385°F

<u>Sample Data</u>		<u>Vis</u> cs/100°F	<u>100°F Vis</u> Increase, %	<u>Vis,</u> cs/210°F	<u>Neut. No.,</u> mg KOH/g	<u>Oil Loss,</u> wt %
Initial		27.50	--	5.08	0.07	
16 hr		29.92	8.8	5.36	0.21	
24 hr		30.72	11.7	5.45	0.24	
40 hr		31.85	15.8	5.68	0.30	
48 hr		32.59	18.5	5.70	0.31	16
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.04	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	+0.02	Tube deposits: Below oil level At and above oil level		
		Steel	-0.04			
		Cu	-0.06			
		Mg	0.0			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	NC				
	Ti	Lt tan			Sample temperature, °F	385
	Ag	Lt yellow			Sample volume, ml	200
	Steel	Blue			Air rate, liter/hr	130
	Cu	Purple			Condensate return	Yes
	Mg	NC				

TABLE 84. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 390°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.08	0.07	--			
16 hr	10.0	5.39	0.33	6.0			
24 hr	13.2	5.49	0.27	8.6			
40 hr	18.5	5.69	0.36	12.9			
48 hr	21.8	5.81	0.36	14.5	17	2.69	21.34
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>					
Weight change, mg/cm ² :		Al	+0.06	Sludge in oil:		200-mesh filter	None
		Ti	+0.04			Centrifuge	None
		Ag	-0.04				
		Steel	-0.02	Tube deposits:		Below oil level	None
		Cu	-0.08			At and above oil level	None
		Mg	-0.06				
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>					
Al		NC	Sample temperature, °F		390		
Ti		Grey	Sample volume, ml		200		
Ag		Yellow	Air rate, liter/hr		130		
Steel		Blue	Condensate return		No		
Cu		Rose					
Mg		NC					

TABLE 85. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-2 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, wt %	Overhead Sample	
						Acidity, mg KOH/g	Vis, cs/100°F
Initial	27.50	--	5.08	0.07	--		
16 hr	30.89	12.3	5.48	0.30	10.4		
24 hr	31.96	16.2	5.58	0.40	14.7		
40 hr	35.81	22.9	5.81	0.43	21.4		
48 hr	35.15	27.8	6.01	0.47	23.9	3.93	21.32

Metal Specimen Data

Test Cell Data

Weight charge, mg/cm ² :		Al	+0.14	Sludge in oil:	200-mesh filter	None
		Ti	-0.06		Centrifuge	None
		Ag	0.0			
		Steel	+0.30	Tube deposits:	Below oil level	None
		Cu	-1.54		At and above oil level	None
		Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	NC	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Lt blue	Condensate return	No
Cu	Mod pitting		
Mg	Rose		

TABLE 86. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
CN C-64-12 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	15.44	12.0	3.77	0.61	10.9			
24 hr	15.53	13.0	3.88	0.75	15.8			
40 hr	15.83	14.8	3.91	0.89	25.3			
48 hr	15.54	12.7	3.85	0.96	29.4	23	2.48	11.61

Metal Specimen Data

Weight change, mg/cm²: Al
Ti
Ag
Steel
Cu
Mg

Test Cell Data

Sludge in oil: 200-mesh filter
Centrifuge
None
0.20 ml/25

Tube deposits: Below oil level
At and above oil level
Lt carbon
Lt carbon

Metal discoloration, deposits,
pitting, or etching:

Al Lt brown
Ti Dk brown
Ag Lt brown
Steel Brown
Cu Brown
Mg Brown

Test Conditions

Sample temperature, °F 375
Sample volume, ml 200
Air rate, liter/hr 130
Condensate return No

TABLE 87. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Naut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Sample Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	14.71	6.7	3.70	0.88	16.0			
24 hr	15.39	11.6	3.98	0.86	22.9			
40 hr	15.95	15.7	4.04	1.11	35.5			
48 hr	15.78	14.4	3.86	1.27	41.0	31	2.85	11.95

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.40 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt carbon
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon		
Ti	Lt carbon	Sample temperature, °F	385
Ag	Lt carbon	Sample volume, ml	200
Steel	Lt carbon	Air rate, liter/hr	130
Cu	Mottled carbon	Condensate return	No
Mg	Lt carbon		

TABLE 88. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.79	--	3.52	0.25	--			
16 hr	15.55	12.8	3.90	0.90	20.6			
24 hr	15.81	14.6	3.85	1.04	30.0			
40 hr	15.78	14.4	3.89	0.93	47.5			
48 hr	15.96	15.7	3.91	1.36	55.6	34	3.16	12.14

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.75 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt carbon
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt carbon	Sample temperature, °F	390
Ti	Lt carbon	Sample volume, m ³	200
Ag	Lt carbon	Air rate, liter/hr	130
Steel	Lt carbon	Condensate return	No
Cu	Slight pitting		
Mg	Lt carbon		

TABLE 89. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-12 AT 400°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt. g	Oil Loss, wt%	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.52	0.25	--			
16 hr	12.8	3.81	1.17	25.1			
24 hr	15.4	3.90	1.44	35.9			
40 hr	20.7	4.01	1.86	55.6			
48 hr	23.4	4.11	2.24	64.3	43	3.86	12.22
Metal Specimen Data		Test Cell Data					
Weight change, mg/cm ² :		Sludge in oil: 200-mesh filter Centrifuge					
		None					
		0.25 ml/25					
Metal discoloration, deposits, pitting, or etching:		Tube deposits: Below oil level At and above oil level					
		Lt carbon					
		Lt carbon					
		Lt carbon					
		Steel					
		Cu					
		Mg					
		+0.51					
		+0.51					
		+0.37					
		+0.24					
		+0.12					
		+0.40					
Test Conditions							
Sample temperature, °F		400					
Sample volume, ml		200					
Air rate, liter/hr		130					
Condensate return		No					

TABLE 90. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 375°F

Sample Data					Overhead Sample		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.32	0.28	--			
16 hr	6.9	5.60	0.06	3.7			
24 hr	9.2	5.68	0.05	5.1			
40 hr	14.6	5.88	0.06	7.9	14	1.35	(a)
48 hr	17.4	6.00	0.07	8.9			
Metal Specimen Data					Test Cell Data		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al		+0.04				Centrifuge	0.05 ml/25
Ti		-0.02					
Ag		-0.02					
Steel		+0.04				Tube deposits: Below oil level	None
Cu		-0.47				At and above oil level	None
Mg		0.0					
Metal discoloration, deposits, pitting, or etching:					Test Conditions		
Al		NC				Sample temperature, °F	375
Ti		NC				Sample volume, ml	200
Ag		White				Air rate, liter/hr	130
Steel		Lt brown				Condensate return	No
Cu		Slight etching					
Mg		NC					

(a) Insufficient sample.

TABLE 91. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	--	5.32	0.28	--			
16 hr	30.83	8.4	5.64	0.03	5.8			
24 hr	31.76	11.7	5.76	0.05	8.1			
40 hr	33.71	18.6	6.05	0.06	11.5			
48 hr	35.32	24.2	6.24	0.10	12.7	19	1.57	17.74

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	0.05 ml/25
	Ag	+0.04			
	Steel	-0.02	Tube deposits:	Below oil level	None
	Cu	-0.65		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	White
Steel	Lt brown
Cu	Slight pitting
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 92. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 385°F

Sample Data

	<u>Vis, cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	28.43	--	5.32	0.28	
16 hr	30.77	8.2	5.65	0.02	
24 hr	31.56	11.0	5.76	0.03	
40 hr	33.53	17.9	6.03	0.04	
48 hr	34.85	22.6	6.19	0.04	18

Metal Specimen Data

<u>Weight change, mg/cm²:</u>		<u>Test Cell Data</u>	
Al	+0.04	Sludge in oil:	200-mesh filter None
Ti	0.0		Centrifuge 0.05 ml/25
Ag	0.0		
Steel	+0.12	Tube deposits:	Below oil level None
Cu	-0.39		At and above oil level None
Mg	+0.08		
<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>	
Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	White	Air rate, liter/hr	130
Steel	Yellow-brown	Condensate return	Yes
Cu	Lt pitting		
Mg	NC		

TABLE 93. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	--	5.32	0.28	--			
16 hr	30.88	8.6	5.64	0.04	9.7			
24 hr	31.86	12.1	5.81	0.10	13.9			
40 hr	34.21	20.3	6.11	0.63	20.8			
48 hr	35.87	26.2	6.32	0.09	23.4	21	1.74	17.55

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	-0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	0.05 ml/25
	Ag	0.0			
	Steel	-0.10	Tube deposits:	Below oil level	None
	Cu	-0.67		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC			
Ti	Lt yellow	Sample temperature, °F	390	
Ag	NC	Sample volume, ml	200	
Steel	Lt brown	Air rate, liter/hr	130	
Cu	Severe etching	Condensate return	No	
Mg	NC			

TABLE 94. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-13 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Oil Loss, Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.43	-	5.32	0.28	--			
16 hr	31.67	11.4	5.76	0.06	13.0			
24 hr	33.21	16.8	5.96	0.09	18.3			
40 hr	37.00	30.1	6.44	0.21	26.0			
48 hr	80.52	183	10.48	5.73	34.4	30	27.22	14.88

Metal Specimen Data

Weight change, mg/cm ² :	Test Cell Data		
	Sludge in oil:	200-mesh filter Centrifuge	None 0.10 ml/25
Al	+0.14		
Ti	-0.18		
Ag	0.0		
Steel	+0.02	Tube deposits: Below oil level	None
Cu	-1.28	At and above oil level	None
Mg	-0.02		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	400
Ti	NC	Sample volume, ml	200
Ag	White	Air rate, liter/hr	130
Steel	Purple	Condensate return	No
Cu	Severe etching		
Mg	NC		

TABLE 95. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.06	--	3.34	0.17	--			
16 hr	13.56	3.8	3.43	1.02	15.8			
24 hr	13.43	2.8	3.42	1.21	23.1			
40 hr	13.77	5.4	3.44	1.48	37.6			
48 hr	13.67	4.7	3.45	1.57	44.8	28	4.08	12.58

Metal Specimen Data

Weight change, mg/cm ² :	Al	+0.14
	Ti	+0.14
	Ag	+0.16
	Steel	+0.12
	Cu	+0.18
	Mg	+0.18

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Med var
	At and above oil level	Med var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt carbon
Ti	Lt carbon
Ag	Lt carbon
Steel	Lt carbon
Cu	Lt carbon
Mg	Lt carbon

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 96. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 390°F

Sample Data								Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	--	3.34	0.17	--					
16 hr	4.4	3.44	1.14	18.0					
24 hr	4.1	3.43	1.35	27.0					
40 hr	5.4	3.46	1.97	44.5					
48 hr	30.9	3.96	13.97	55.6	36	5.72	12.26		
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter					
Al				Centrifuge					
Ti				None					
Ag				None					
Steel				Med var					
Cu				Med var					
Mg				Med var					
Metal discoloration, deposits, pitting, or etching:				Test Conditions					
Al				Sample temperature, °F					
Ti				390					
Ag				Sample volume, ml					
Steel				200					
Cu				Air rate, liter/hr					
Mg				130					
				Condensate return					
				No					

TABLE 97. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 390°F

Sample Data									
V _s , cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g Vis, cs/100°F		
Initial	13.06	--	3.34	0.17	--				
16 hr	13.54	3.7	3.43	1.09	17.9				
24 hr	13.64	4.4	3.42	1.16	26.9				
40 hr	13.80	5.7	3.47	1.80	45.1				
48 hr	16.39	25.5	3.86	11.40	55.3	37	5.03		12.30
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Al	+0.28	Sludge in oil:		200-mesh filter	None
				Ti	+0.32			Centrifuge	Trace
				Ag	+0.24				
				Steel	+0.22	Tube deposits:		Below oil level	Lt var
				Cu	+0.16			At and above oil level	Lt var
Mg				+0.20					
Metal discoloration, deposits, pitting, or etching:				Test Conditions					
Al				Lt carbon	Sample temperature, °F		390		
Ti				Lt carbon	Sample volume, ml		200		
Ag				Lt carbon	Air rate, liter/hr		130		
Steel				Lt carbon	Condensate return		No		
Cu				Mottled carbon					
Mg				Lt carbon					

TABLE 98. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-16 AT 400°F

Sample Data								Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F		
Initial	--	3.34	0.17	--					
16 hr	4.2	3.42	1.41	24.4					
24 hr	4.4	3.43	1.78	36.0					
40 hr	1365	6.85	43.6	76.8					
48 hr (a)	--	(a)	49.6	84.7	55	24.7	11.33		
Metal Specimen Data								Test Cell Data	
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter				(a)	
Al				Centrifuge				(a)	
Ti									
Ag				Tube deposits: Below oil level				Lt var	
Steel				At and above oil level				Lt var	
Cu									
Mg									
Metal discoloration, deposits, pitting, or etching:								Test Conditions	
Al				Sample temperature, °F				400	
Ti				Sample volume, ml				200	
Ag				Air rate, liter/hr				130	
Steel				Condensate return				No	
Cu									
Mg									

(a) Sample gelled.

TABLE 99. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.20	0.11	--			
16 hr	18.00	6.9	4.51	0.66	13.6			
24 hr	18.46	9.6	4.61	0.70	19.7			
40 hr	19.52	15.9	4.84	0.93	30.4			
48 hr	20.27	20.4	5.00	1.10	34.7	28	2.56	11.02

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.04
	Ag	-0.02
	Steel	+0.04
	Cu	-0.06
	Mg	-0.02

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	Lt var
	At and above oil level	Lt carbon

Metal discoloration, deposits,
pitting, or etching:

Al	Grey
Ti	Lt yellow
Ag	Lt yellow
Steel	Brown
Cu	Lt green
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 100. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.29	0.11	--			
16 hr	18.31	8.7	4.56	0.86	22.8			
24 hr	18.80	11.6	4.69	0.96	31.7			
40 hr	20.20	20.0	4.96	1.45	47.9			
48 hr	21.42	27.2	5.22	1.69	55.0	36	3.11	11.21

Metal Specimen Data

Weight change, mg/cm ² :		Sludge in oil:	
Al	0.0	200-mesh filter	None
Ti	0.0	Centrifuge	Trace
Ag	0.0		
Steel	0.0	Tube deposits:	Below oil level Lt var
Cu	-0.10		At and above oil level Lt var
Mg	-0.02		

Metal discoloration, deposits,
pitting, or etching:

Test Cell Data

Al	Grey	Sample temperature, °F	385
Ti	Blue	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Lt brown		
Mg	Grey		

TABLE 101. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 390°F

Sample Data

	Vis. cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.84	--	4.29	0.11	--			
16 hr	18.33	8.8	4.58	0.98	25.7			
24 hr	18.87	12.1	4.68	1.19	36.9			
40 hr	20.36	20.9	5.01	1.91	37.3			
48 hr	22.08	31.1	4.97	3.19	47.4	43	2.47	10.75

Metal Specimen Data

Test Cell Data

Weight change, rag/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	Trace
	Ag	+0.02			
	Steel	-0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.26		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Grey		Sample temperature, °F	390
Ti	Blue		Sample volume, ml	200
Ag	Lt yellow		Air rate, liter/hr	130
Steel	Yellow-green		Condensate return	No
Cu	Slight etching			
Mg	Green			

TABLE 102. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-18 AT 400°F

Sample Data							
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	4.29	0.11	--			
16 hr	10.3	4.62	1.32	33.8			
24 hr	14.0	4.73	1.84	47.6			
40 hr	1140	9.32	24.8	84.9			
48 hr	--	(a)	(a)	93.0	58	15.25	10.93
Test Cell Data							
Metal Specimen Data							
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:		200-mesh filter	(a)
		Ti	-0.22(b)			Centrifuge	(a)
		Ag	-0.02				
		Steel	+0.02	Tube deposits:		Below oil level	Lt var
		Cu	-1.40			At and above oil level	Lt var
		Mg	+0.02				
Test Conditions							
Metal discoloration, deposits, pitting, or etching:		Al	Lt yellow	Sample temperature, °F		400	
		Ti	Lt yellow	Sample volume, ml		200	
		Ag	Lt yellow	Air rate, liter/hr		130	
		Steel	Brown	Condensate return		No	
		Cu	Severe etching				
		Mg	Lt green				

- (a) Insufficient sample.
(b) Weight error suspected.

TABLE 103. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-21 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.56	--	3.55	0.07	--			
16 hr	15.97	2.6	3.62	0.10	13.3			
24 hr	16.11	3.5	3.63	0.12	19.5			
40 hr	16.46	5.8	3.69	0.22	31.5			
48 hr	16.74	7.6	3.72	0.26	37.3	26	1.64	15.36

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	-0.02	Sludge in oil: 200-mesh filter
	Ti	0.0	Centrifuge
	Ag	0.0	
	Steel	-0.02	Tube deposits: Below oil level
	Cu	-0.26	At and above oil level
	Mg	0.0	None

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	390
Ti	Lt brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	No
Cu	Slight pitting		
Mg	NC		

TABLE 104. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead		Overhead Sample	
					Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.00	3.9	4.21	0.20	8.1			
24 hr	19.26	5.4	4.25	0.28	13.1			
40 hr	19.70	7.8	4.34	0.40	22.7			
48 hr	20.17	10.3	4.39	0.41	27.4	23	2.41	14.97

Metal Specimen Data

Normal Electro-
Clean-up cleaned

Test Cell Data

Weight change, mg/cm ² : Al	0.0	-0.02	Sludge in oil: 200-mesh filter	None
Ti	-0.02	-0.02	Centrifuge	None
Ag	-0.06	-0.04		
Steel	-0.02	-0.02	Tube deposits: Below oil level	None
Cu	-0.06	-0.10	At and above oil level	None
Mg	-0.08	-0.10		

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Purple
Cu	Red-yellow
Mg	Grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 105. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	18.28	--	4.09	0.17	
16 hr	19.00	3.9	4.23	0.20	
24 hr	19.27	5.4	4.26	0.27	
40 hr	19.70	7.8	4.32	0.38	
48 hr	20.11	10.0	4.39	0.46	24

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	-0.04		Centrifuge	None
	Ag	-0.06			
	Steel	0.0	Tube deposits:	Below oil level	None
	Cu	-0.06		At and above oil level	None
	Mg	-0.14			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	NC	Air rate, liter/hr	130
Steel	Purple	Condensate return	Yes
Cu	Yellow-orange		
Mg	Grey		

TABLE 106. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample:	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.04	4.2	4.22	0.22	9.7			
24 hr	19.38	6.0	4.26	0.31	15.7			
40 hr	19.95	9.1	4.36	0.43	27.6			
48 hr	20.50	12.1	4.44	0.48	33.2	26	2.16	15.03

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge	None
	Ag	-0.04	Tube deposits: Below oil level At and above oil level		
	Steel	+0.04			
	Cu	-0.02			
	Mg	-0.16			

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	NC
Steel	Purple
Cu	Brown-orange
Mg	Grey

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 107. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 390°F

Sample Data

	Vis., cs/100°F	00°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.04	4.2	4.22	0.24	11.9			
24 hr	19.31	5.6	4.26	0.30	17.5			
40 hr	19.84	8.5	4.29	0.42	28.2			
48 hr	20.32	11.2	4.44	0.47	33.2	24	2.60	15.07

Metal Specimen Data

Weight change, ng/cm ² :	Al	10.06
	Ti	10.06
	Ag	0.0
	Steel	0.04
	Cu	-0.14
	Mg	-0.14

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Tan
Ag	White
Steel	Purple
Cu	Orange
Mg	Grey

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 108. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-22 AT 400°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead		Overhead Sample	
					Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	18.28	--	4.09	0.17	--			
16 hr	19.20	5.0	4.23	0.31	10.8			
24 hr	19.52	6.8	4.30	0.40	19.3			
40 hr	20.35	11.3	4.44	0.53	35.4			
48 hr	21.17	15.8	4.52	0.54	42.4	32	2.47	15.02

Metal Specimen Data

Weight change, mg/cm²: Al
Ti
Ag
Steel
Cu
Mg

Test Cell Data

Sludge in oil: 200-mesh filter
Centrifuge
None
None
Tube deposits: Below oil level
At and above oil level
None
None

Metal discoloration, deposits,
pitting, or etching:

Al
Ti
Ag
Steel
Cu
Mg

Test Conditions

Sample temperature, °F
Sample volume, ml
Air rate, liter/hr
Condensate return

NC
Lt tan
NC
Blue
Green-orange
Slight etching

400
200
130
No

TABLE 109. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-25 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	28.76	--	5.3	0.0	--			
16 hr	29.98	4.2	5.5	0.07	1.8			
24 hr	30.54	6.2	5.60	0.09	2.5			
40 hr	31.31	8.9	5.72	0.13	3.7			
48 hr	31.80	10.6	5.77	0.15	8.3	12	1.89	21.51

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.05 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	None
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Tan	Sample volume, ml	200
Ag	Lt tan	Air rate, liter/hr	130
Steel	Blue-green	Condensate return	No
Cu	Brown		
Mg	NC		

TABLE 110. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-2, AT 385°F

Sample Data					
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	28.76	--	5.36	0.0	
16 hr	30.01	4.3	5.54	0.11	
24 hr	30.53	6.2	5.59	0.14	
40 hr	31.23	8.8	5.68	0.14	
48 hr	31.74	10.4	5.74	0.15	12
Metal Specimen Data					
Test Cell Data					
Weight change, mg/cm ² :					
Al	0.0				
Ti	-0.02				
Ag	0.0				
Steel	0.0				
Cu	-0.16				
Mg	0.0				
Sludge in oil: 200-mesh filter None					
Centrifuge 0.05 ml/25					
Tube deposits: Below oil level None					
At and above oil level None					
Test Conditions					
Metal discoloration, deposits, pitting, or etching:					
Al	NC				
Ti	Lt tan				
Ag	NC				
Steel	Green-blue				
Cu	Orange				
Mg	NC				
Sample temperature, °F 385					
Sample volume, ml 200					
Air rate, liter/hr 130					
Condensate return Yes					

TABLE III. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-25 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg. KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.76	--	5.36	0.0	
16 hr		29.96	4.2	5.51	0.07	
24 hr		30.55	6.2	5.64	0.10	
40 hr		31.23	8.6	5.66	0.14	
48 hr		31.75	10.4	5.76	0.15	11
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil: 200-mesh filter None		
		Ti	+0.04	Centrifuge 0.0 ml/25		
		Ag	+0.06			
		Steel	+0.02	Tube deposits: Below oil level None		
		Cu	+0.04	At and above oil level None		
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan	Sample temperature, °F		
		Ag	Lt yellow	Sample volume, ml		
		Steel	Blue-green	Air rate, liter/hr		
		Cu	Brown	Condensate return		
		Mg	NC			

TABLE 112. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 385°F

Sample Data						Overhead Sample	
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.10	0.33	--			
16 hr	27.9	3.62	0.24	49.6			
24 hr	42.6	3.88	0.29	65.7			
40 hr	78.1	4.48	0.36	86.7			
48 hr	109	4.97	0.41	92.3	54	1.37	9.39
Metal Specimen Data		Normal Clean-up		Electro- cleaned		Test Cell Data	
Weight change, mg/cm ² :		Al		-0.06		Sludge in oil: 200-mesh filter	
		Ti		-0.02		Centrifuge	
		Ag		-0.06		None	
		Steel		-0.02		Tube deposits: Below oil level	
		Cu		-0.36		At and above oil	
		Mg		+0.06		level	
						None	
Metal discoloration, deposits, pitting, or etching:		Test Conditions					
Al		Lt yellow				Sample temperature, °F	
Ti		Lt tan				Sample volume, ml	
Ag		Lt yellow				Air rate, liter/hr	
Steel		Brown-yellow				Condensate return	
Cu		Brown				No	
Mg		Yellow					

TABLE 113. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 385°F

Sample Data					
	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	12.77	--	3.10	0.33	
16 hr	16.38	28.3	3.63	0.26	
24 hr	18.28	43.1	3.90	0.26	
40 hr	22.76	78.2	4.47	0.34	
48 hr	26.32	106	4.92	0.47	52
Metal Specimen Data					
Test Cell Data					
W ght change, mg/cm ² :	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	-0.02	Tube deposits: Below oil level At and above oil level		
	Steel	-0.04			
	Cu	-0.35			
	Mg	+0.06			None
Metal discoloration, deposits, pitting, or etching:					
Test Conditions					
Al	Lt yellow		Sample temperature, °F		385
Ti	Lt tan		Sample volume, ml		200
Ag	Lt yellow		Air rate, liter/hr		130
Steel	Yellow-brown		Condensate return		Yes
Cu	Slight pitting				
Mg	Yellow				

TABLE 114. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-64-26 AT 390°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	3.10	0.33	--			
16 hr	31.2	3.76	0.28	53.7			
24 hr	47.9	4.02	0.33	71.2			
40 hr	89.4	4.67	0.39	93.2			
48 hr	127	5.28	0.46	98.9	58	1.26	9.26
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag							
Steel				Tube deposits: Below oil level			
Cu				At and above oil level			
Mg							
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu							
Mg							

TABLE 115. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-1 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.91	--	3.76	0.07	--			
16 hr	15.76	5.7	3.92	0.31	18.4			
24 hr	16.13	8.2	3.96	0.56	27.0			
40 hr	40.18	169	6.90	22.0	53.7			
48 hr	94.18	532	12.90	26.2	61.9	45	28.3	9.75

Metal Specimen Data

Normal Electro-
Clean-up cleaned

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	-0.06	Sludge in oil:	200-mesh filter	None
	Ti	-0.06	-0.06		Centrifuge	Trace
	Ag	0.0	0.0			
	Steel	0.0	0.0	Tube deposits:	Below oil level	Lt var
	Cu	-4.62	-4.65		At and above oil level	None
	Mg	-0.08	-0.12			

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Blue
Cu	Severe etch
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 116. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-55-1 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	14.91	--	3.76	0.07	
16 hr	15.75	5.6	3.91	0.30	
24 hr	16.15	8.3	3.97	0.53	
40 hr	40.97	175	7.00	21.5	
48 hr	110.2	639	14.22	29.2	44

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	Trace
	Ag	0.0			
	Steel	0.0	Tube deposits:	Below oil level	Very lt var
	Cu	-3.73		At and above oil	
	Mg	+0.06		level	None

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Severe etch		
Mg	NC		

TABLE 117. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-1 AT 390°F

<u>Sample Data</u>											
<u>Vis, cs/100°F</u>		<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Overhead Wt, g</u>	<u>Oil Loss, wt %</u>	<u>Overhead Sample</u>				
							<u>Acidity, mg KOH/g</u>	<u>Vis, cs/100°F</u>			
Initial	14.91	--	3.76	0.07	--						
16 hr	15.86	6.4	3.92	0.42	22.3						
24 hr	16.22	8.8	3.97	0.85	32.6						
40 hr	73.23	391	11.01	24.3	64.9						
48 hr	373.0	2402	32.79	21.5	69.9	50	29.39	10.00			
<u>Metal Specimen Data</u>											
<u>Test Cell Data</u>											
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter							
Al				Centrifuge							
Ti				None							
Ag				Trace							
Steel				Tube deposits: Below oil level							
Cu				At and above oil level							
Mg				None							
				Lt var							
<u>Test Conditions</u>											
Metal discoloration, deposits, pitting, or etching:				Sample temperature, °F							
Al				Sample volume, ml							
Ti				Air rate, liter/hr							
Ag				Condensate return							
Steel				No							
Cu											
Mg											

TABLE 118. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-2 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
				mg KOH/g			Acidity, mg KOH/g	Vis, cs/100°F	
Initial	13.34	--	3.10	0.64	--				
16 hr	14.40	7.9	3.31	0.10	41.9				
24 hr	15.27	14.5	3.42	0.08	60.4				
40 hr	17.86	33.9	3.82	0.42	88.0				
48 hr	19.96	49.6	4.11	0.09	94.5	57	0.90		11.57
Metal Specimen Data				Test Cell Data					
				Normal Clean-up	Electro-cleaned				
Weight change, mg/cm ² :				Al	-0.02	-0.06	Sludge in oil:		200-mesh filter
				Ti	-0.04	-0.04			Centrifuge
				Ag	-0.02	-0.06			
				Steel	0.0	0.0	Tube deposits:		Below oil level
				Cu	-0.41	-0.43			At and above oil level
				Mg	+0.10	+0.10			None
Metal discoloration, deposits, pitting, or etching:									
				Al	NC				
				Ti	Lt tan				Sample temperature, °F
				Ag	Lt yellow				Sample volume, ml
				Steel	Lt tan				Air rate, liter/hr
				Cu	Pits				Condensate return
				Mg	NC				No

TABLE 119. RESULTS OF REFLUX OXIDATION-CORROSION TEST
CN O-65-2 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		13.34	--	3.10	0.64	
16 hr		14.41	8.0	3.31	0.08	
24 hr		15.37	15.2	3.45	0.10	
40 hr		18.04	35.2	3.84	0.08	
48 hr		20.13	50.7	4.16	0.06	55
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	-0.05		Centrifuge	Trace
		Ag	+0.04	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	-0.41			
		Mg	0.0			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	Lt yellow	Sample temperature, °F		385
		Ti	Lt tan	Sample volume, ml		200
		Ag	Lt yellow	Air rate, liter/hr		130
		Steel	Lt tan	Condensate return		Yes
		Cu	Pits			
		Mg	NC			

TABLE 120. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-2 At 390°F

<u>Sample Data</u>		Vis, 100°F		Vis, 210°F		Neut. No., mg KOH/g		Overhead		<u>Overhead Sample</u>			
cs/100°F		Increase, %		cs/210°F		mg KOH/g		Wt, g		Acidity, mg KOH/g		Vis, cs/100°F	
Initial	13.44	--	--	3.10	0.64	--	--						
16 hr	14.57	9.2		3.41	0.09	47.5							
24 hr	15.67	17.5		3.49	0.06	68.0							
40 hr	18.88	41.5		3.97	0.06	96.1							
48 hr	21.40	60.4		4.36	0.07	101.5	60	0.92				11.57	
<u>Metal Specimen Data</u>													
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:		200-mesh filter		Centrifuge		None		Insufficient sample	
		Ti	0.0									None	
		Steel	+0.02									None	
		Cu	-0.45									None	
		Mg	-0.04									None	
<u>Metal discoloration, deposits, pitting, or etching:</u>													
		Al	NC										
		Ti	Lt tan									390	
		Ag	Lt yellow									200	
		Steel	Lt tan									130	
		Cu	Pits									No	
		Mg	NC										
<u>Test Conditions</u>													
										Sample temperature, °F		390	
										Sample volume, ml		200	
										Air rate, liter/hr		130	
										Condensate return		No	

TABLE 121. RESULTS OF NONREFLUX OXIDATION-COI ROSION TEST
ON O-65-3 AT 385°F

Sample Data				Test Cell Data				Test Conditions			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Acidity, mg KOH/g	Overhead Sample Vis, cs/100°F				
Initial	--	4.52	0.24	--							
16 hr	14.2	5.04	0.68	42.2							
24 hr	26.2	5.51	0.85	61.0							
40 hr	93.8	8.14	1.27	93.4							
48 hr	319	16.08	2.01	102.4	64	1.58	10.73				
Metal Specimen Data				Test Cell Data							
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter							
Al				(a)							
Ti				Centrifuge							
Ag				None							
Steel				None							
Cu				Lt var							
Mg				Lt var							
Metal discoloration, deposits, pitting, or etching:				Tube deposits: Below oil level							
Al				At and above oil level							
Ti				Lt rose							
Ag				Lt purple							
Steel				Lt orange							
Cu				Blue-green							
Mg				Green-brown							
				Lt brown							
				Sample temperature, °F							
				Sample volume, ml							
				Air rate, liter/hr							
				Condensate return							
				No							

(a) Insufficient sample.

TABLE 22. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-3 /T 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		17.05	--	4.52	0.24	
16 hr		19.46	14.1	5.00	0.65	
24 hr		21.12	23.9	5.46	0.84	
40 hr		30.88	81.1	7.56	1.29	
48 hr		63.26	271	14.24	1.83	60
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.04	Sludge in oil:	200-mesh filter	None
		Ti	-0.08		Centrifuge	(a)
		Ag	-0.02	Tube deposits: Below oil level At and above oil level		
		Steel	-0.02			
		Cu	-0.12			
		Mg	+0.02			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	Lt rose	Sample temperature, °F		
		Ti	Lt purple	Sample volume, ml		
		Ag	Lt orange	Air rate, liter/hr		
		Steel	Blue-green	Condensate return		
		Cu	Green-brown			Yes
		Mg	NC			

(a) Insufficient sample.

TABLE 123. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 385°F

Sample Data				Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.28	0.15	-			
16 hr	10.2	5.66	0.37	0.7			
24 hr	12.2	5.72	0.38	1.1			
40 hr	15.1	5.80	0.42	1.9			
48 hr	15.8	5.86	0.50	2.3	9	(a)	(a)
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Normal Electro- Clean-up			
Al				0.0			
Ti				-0.08			
Ag				-0.04			
Steel				-0.04			
Cu				-0.26			
Mg				+0.14			
Metal discoloration, deposits, pitting, or etching:				Sludge in oil: 100-mesh filter Centrifuge			
Al				None			
Ti				None			
Ag				None			
Steel				None			
Cu				None			
Mg				None			
Metal discoloration, deposits, pitting, or etching:				Tube deposits: Below oil level At and above oil level			
Al				None			
Ti				None			
Ag				None			
Steel				None			
Cu				None			
Mg				None			
Test Conditions				Sample temperature, °F			
Al				385			
Ti				200			
Ag				130			
Steel				No			
Cu				No			
Mg				No			

(a) Insufficient sample.

TABLE 124. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 385°F

<u>Sample Data</u>		<u>Vis.,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis.,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		27.92	--	5.28	0.15	
16 hr		30.84	10.5	5.67	0.35	
24 hr		31.35	12.3	5.72	0.35	
40 hr		32.11	15.0	5.83	0.40	
48 hr		32.21	15.4	5.86	0.45	9
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	-0.06		Centrifuge	None
		Ag	+0.06	Tube deposits: Below oil level At and above oil level		
		Steel	+0.02			
		Cu	-0.32			
		Mg	-0.02			None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC	Sample temperature, °F		
		Ti	Lt tan	Sample volume, ml		
		Ag	NC	Air rate, liter/hr		
		Steel	Blue	Condensate return		
		Cu	Pits			Yes
		Mg	NC			

TABLE 125. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-4 AT 390°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
<u>Vis,</u> <u>cm/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Overhead</u> <u>Wt. g</u>	<u>Oil Loss,</u> <u>wt %</u>	<u>Acidity,</u> <u>mg KOH/g</u>	<u>Vis,</u> <u>cs/100°F</u>
Initial	--	5.28	0.15	--			
16 hr	11.0	5.67	0.38	1.0			
24 hr	13.0	5.74	0.40	1.5			
40 hr	16.2	5.85	0.47	2.5			
48 hr	18.1	5.91	0.48	3.0	10	4.88	22 20
<u>Metal Specimen Data</u>				<u>Test Cell Data</u>			
<u>Weight change, mg/cm²:</u>				<u>Sludge in oil:</u>			
Al				200-mesh filter			
Ti				Centrifuge			
Ag							
Steel							
Cu				<u>Tube deposits:</u>			
Mg				Below oil level			
				At and above oil level			
				None			
				None			
				None			
				None			
<u>Metal discoloration, deposits,</u> <u>pitting, or etching:</u>				<u>Test Conditions</u>			
Al				<u>Sample temperature, °F</u>			
Ti				390			
Ag				<u>Sample volume, ml</u>			
Steel				200			
Cu				<u>Air rate, liter/hr</u>			
Mg				130			
				<u>Condensate return</u>			
				No			

TABLE 126. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g Vis, cs/100°F		
Initial	19.44	--	4.03	0.15	--				
16 hr	22.24	14.4	4.42	0.26	41.9				
24 hr	22.27	17.6	4.52	0.28	60.4				
40 hr	23.99	23.4	4.72	0.28	88.0				
48 hr	25.42	30.8	4.86	0.30	94.5	27	0.90		11.57
Metal Specimen Data				Test Cell Data					
Weight change, mg/cm ² :				Normal Clean-up	Electro- cleaned				
Al				-0.02	-0.02	Sludge in oil:	200-mesh filter	None	
Ti				-0.06	-0.06		Centrifuge	None	
Ag				-0.06	-0.08				
Steel				-0.02	-0.04	Tube deposits:	Below oil level	None	
Cu				-0.79	-0.83		At and above oil level	None	
Mg				+0.16	+0.12				
Metal discoloration, deposits, pitting, or etching:						Test Conditions			
Al						Sample temperature, °F			
Ti						Sample volume, ml			
Ag						Air rate, liter/hr			
Steel						Condensate return			
Cu						No			
Mg						NC			

TABLE 127. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 385°F

<u>Sample Data</u>		<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		19.44	--	4.03	0.15	
16 hr		22.21	14.2	4.43	0.29	
24 hr		22.89	17.7	4.52	0.27	
40 hr		24.44	25.7	4.71	0.31	
48 hr		25.57	31.5	4.86	0.31	27
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	-0.06		Centrifuge	None
		Ag	+0.06	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	-0.81			
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan			
		Ag	NC			
		Steel	Blue			
		Cu	Pits	Sample temperature, °F		385
		Mg	NC	Sample volume, ml		200
				Air rate, liter/hr		130
				Condensate return		Yes

TABLE 128. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-5 AT 390°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.44	--	4.03	0.15	--			
16 hr	22.41	15.3	4.45	0.31	18.7			
24 hr	23.18	19.2	4.55	0.31	27.7			
40 hr	25.20	29.6	4.82	0.30	44.4			
48 hr	26.87	38.2	5.03	0.31	51.7	32	1.80	17.26

Metal Specimen Data

Weight change, mg/cm ² :		Test Cell Data	
Al	0.0	Sludge in oil:	200-mesh filter
Ti	-0.02		Centrifuge
Ag	-0.04	Tube deposits: Below oil level	
Steel	+0.04		
Cu	-0.87		
Mg	-0.12	At and above oil level	None
			None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	Lt yellow
Steel	Blue
Cu	Brown
Mg	NC

Test Conditions

Sample temperature, °F	390
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 129. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-S AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.07	--	4.08	0.01	--			
16 hr	19.54	2.5	4.12	0.08	5.3			
24 hr	19.82	3.9	4.16	0.15	7.9			
40 hr	20.16	5.7	4.32	0.19	12.5			
48 hr	20.52	7.6	4.26	0.21	14.4	16	1.51	17.36

Metall Specimen Data

Weight change, mg/cm²: Al +0.02
Ti +0.04
Ag +0.02
Steel +0.02
Cu -0.10
Mg 0.0

Test Cell Data

Sludge in oil: 200-mesh filter None
Centrifuge Trace
Tube deposits: Below oil level None
At and above oil level None

Metal discoloration, deposits,
pitting, or etching:

Al NC
Ti Lt tan
Ag NC
Steel Lt blue
Cu Orange
Mg NC

Test Conditions

Sample temperature, °F 385
Sample volume, ml 200
Air rate, liter/hr 130
Condensate return No

TABLE 130. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-8 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	19.07	--	4.08	0.01				
16 hr	19.58	2.7	4.12	0.08	4.3			
24 hr	19.79	3.8	4.15	0.15	6.2			
40 hr	20.19	5.9	4.22	0.19	9.4			
48 hr	20.52	7.6	4.26	0.20	10.8	16	1.32	17.54

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter Centrifuge	None 0.05 ml/25
	Ti	0.0			
	Ag	0.0	Tube deposits:	Below oil level At and above oil level	None None
	Steel	0.0			
	Cu	-0.10			
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F 385
Ti	Lt tan	
Ag	NC	
Steel	Blue	
Cu	Orange	
Mg	NC	Sample volume, ml 200
		Air rate, liter/hr 130
		Condensate return No

TABLE 131. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-8 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		19.07	--	4.08	0.01	
16 hr		19.56	2.6	4.11	0.08	
24 hr		19.78	3.7	4.17	0.13	
40 hr		20.19	5.9	4.23	0.21	
48 hr		20.50	7.5	4.26	0.21	15
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	0.05 ml/25
		Ag	0.0			
		Steel	+0.02	Tube deposits:	Below oil level	None
		Cu	-0.02		At and above oil level	None
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
		Al	NC			
		Ti	Lt tan			385
		Ag	NC			200
		Steel	Blue			130
		Cu	Orange			Yes
		Mg	NC			

TABLE 132. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-14 AT 385°F

Sample Data								
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample Acidity, mg KOH/g Vis, cs/100°F	
Initial	17.71	--	4.67	0.24	--			
16 hr	19.57	10.5	5.08	0.70	39.1			
24 hr	21.41	20.9	5.47	0.88	56.8			
40 hr	23.07	30.3	5.29	10.12	88.2			
48 hr	119.9	577	16.04	28.9	101.7	60	5.55 10.64	
Metal Specimen Data				Test Cell Data				
Weight change, mg/cm ² :				Al	Sludge in oil:		200-mesh filter	None
				Ti			Centrifuge	(a)
				Ag				
				Steel	Tube deposits:		Below oil level	Med var
				Cu			At and above oil level	Med var
Mg								
Metal discoloration, deposits, pitting, or etching:				Test Conditions				
Al				NC		Sample temperature, °F		385
Ti				Blue-green		Sample volume, ml		200
Ag				Lt yellow		Air rate, liter/hr		130
Steel				Peacock		Condensate return		No
Cu				Lt brown				
Mg				Lt pitting				

(a) Insufficient sample.

TABLE 133. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-14 AT 385°F

Sample Data

	<u>Vis, ca/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial	17.71	--	4.67	0.24	
16 hr	19.40	9.5	5.01	0.66	
24 hr	20.88	17.9	5.36	0.84	
40 hr	23.05	30.2	5.15	13.19	
48 hr	97.83	452	14.01	30.7	58

Metal Specimen Data

<u>Weight change, mg/m²:</u>		<u>Test Cell Data</u>	
Al	-0.10	Sludge in oil:	200-mesh filter
Ti	-0.08		Centrifuge
Ag	-0.04		None
Steel	+0.02	Tube deposits:	Below oil level
Cu	-0.04		At and above oil
Mg	0.0		level
			Med var
			Med var

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Blue-green
Ag	Lt yellow
Steel	Peacock
Cu	Lt brown
Mg	Lt brown

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	Yes

(a) Insufficient sample

TABLE 134. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-15 AT 385°F

Sample Data					Overhead Sample			
Vis., cs/100°F	100°F Vis Increase %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	5.64	0.02	--				
16 hr	7.0	5.29	0.18	2.8				
24 hr	9.4	5.38	0.33	4.0				
40 hr	13.3	5.52	0.42	5.6				
48 hr	15.7	5.61	0.45	6.4	11	3.65	23.20	
Metal Specimen Data					Test Cell Data			
Weight change mg/cm ² :					Sludge in oil:	200-mesh filter Centrifuge	None None	
Al					Tube deposits: Below oil level At and above oil level			
Ti								
Ag								
Steel								
Cu								
Mg								
Metal discoloration, deposits, pitting, or etching:					Test Conditions			
Al					Sample temperature, °F			
Ti					Sample volume, ml			
Ag					Air rate, liter/hr			
Steel					Condensate return			
Cu					385			
Mg					290			
					130			
					No			

TABLE 135. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-15 AT 385°F

<u>Sample Data</u>						
	<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>	
Initial	27.20	--	5.04	0.02		
16 hr	29.13	7.1	5.29	0.20		
24 hr	29.85	9.7	5.40	0.30		
40 hr	30.56	12.4	5.52	0.42		
48 hr	31.58	16.1	5.63	0.45		11
<u>Metal Specimen Data</u>						
<u>Weight change, mg/cm²:</u>						
	Al	0.0	Sludge in oil:		200-mesh filter	None
	Ti	+0.04			Centrifuge	None
	Ag	0.0				
	Steel	+0.02	Tube deposits:		Below oil level	None
	Cu	-0.06			At and above oil level	None
	Mg	0.0				
<u>Metal discoloration, deposits, pitting, or etching:</u>						
	Al	NC	<u>Test Conditions</u>			
	Ti	Lt tan	Sample temperature, °F			385
	Ag	NC	Sample volume, ml			200
	Steel	Blue-green	Air rate, liter/hr			130
	Cu	Orange-green	Condensate return			Yes
	Mg	NC				

TABLE 136. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-16 AT 385°F

Sample Data									
Vis, cs/100°F		100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample		
				mg KOH/g			Acidity, mg KOH/g	Vis, cs/100°F	
Initial	26.69	--	5.13	0.20	--				
16 hr	28.63	7.3	41	0.20	2.1				
24 hr	29.23	9.5	5.45	0.31	2.8				
40 hr	30.24	13.3	5.59	0.48	3.9				
48 hr	30.82	15.5	5.59	0.54	4.3	9	7.01	20.23	
Metal Specimen Data					Test Cell Data				
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter				
Al					Centrifuge				
Ti					None				
Ag					None				
Steel					None				
Cu					None				
Mg					None				
					Tube deposits: Below oil level				
					At and above oil level				
					None				
					None				
Test Conditions									
Metal coloration, deposits, pitting, or etching:									
Al NC									
Ti Lt tan									
Ag NC									
Steel Blue									
Cu NC									
Mg Orange									
Sample temperature, °F 385									
Sample volume, ml 200									
Air rate, liter/hr 130									
Condensate return No									

TABLE 137. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-16 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	26.69	--	5.13	0.20	
16 hr	28.62	7.2	5.39	0.21	
24 hr	29.26	9.6	5.47	0.31	
40 hr	29.95	12.2	5.56	0.51	
48 hr	30.84	15.5	5.67	0.59	10

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.04
	Ag	-0.02
	Steel	0.0
	Cu	0.0
	Mg	+0.02

Test Cell Data

Sludge in oil:	200-mesh filter Centrifuge	None None
Tube deposits:	Below oil level At and above oil level	None None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt tan
Ag	NC
Steel	Blue
Cu	Orange
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	Yes

TABLE 138. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-18 AT 385°F

Sample Data

	Vis, cs/100°F	100°F V ₁₀ Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.55	--	4.61	0.21	--			
16 hr	19.68	12.1	5.06	0.72	38.6			
24 hr	21.59	23.0	5.50	0.81	55.2			
40 hr	29.19	66.3	7.10	1.23	83.0			
48 hr	43.59	148	10.06	1.85	92.2	59	1.87	10.91

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	+0.02
	Ag	0.0
	Steel	0.0
	Cu	-0.12
	Mg	0.0

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Brown & green
Mg	Yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Dark var
	At and above oil level	Dark var

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 139. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-18 AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		17.55	--	4.61	0.21	
16 hr		17.31	10.0	4.96	0.72	
24 hr		20.92	19.2	5.33	0.79	
40 hr		27.67	57.7	6.79	1.11	
48 hr		40.44	129	9.40	1.68	54
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
<u>Weight change, mg/cm²:</u>		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		W	-0.02			
		Steel	0.0	Tube deposits:	Below oil level	Lt var
		Cu	-0.08		At and above oil	
		Mg	+0.10		level	Lt var
<u>Metal discoloration, deposits,</u> <u>pitting, or etching:</u>		<u>Test Conditions</u>				
		Al	Lt yellow	Sample temperature, °F		395
		Ti	Brown	Sample volume, ml		200
		Ag	Lt yellow	Air rate, liter/hr		130
		Steel	Blue			Yes
		Cu	Lt green & yellow			
		Mg	Yellow			

TABLE 140. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-19 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	17.72	--	4.67	0.25	--			
16 hr	17.49	- 1.3	4.15	0.57	37.7			
24 hr	19.19	+8.3	4.44	0.72	52.3			
40 hr	24.38	+37.6	5.29	1.02	72.2			
48 hr	28.15	+58.9	5.85	1.29	76.3	45	1.68	9.18

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	-0.04
	Steel	0.0
	Cu	-0.18
	Mg	0.0

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	None
	At and above oil level	Lt var

Metal discoloration, deposits,
pitting, or etching:

Al	Lt yellow
Ti	Brown
Ag	Lt yellow
Steel	Blue
Cu	Brown & green
Mg	NC

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 141. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-19 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	17.72	--	4.67	0.25	
16 hr	19.09	7.7	4.91	0.71	
24 hr	20.45	15.4	5.25	0.82	
40 hr	25.52	44.0	6.32	1.02	
48 hr	26.21	47.9	5.82	10.49	52

Metal Specimen Data

Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	-0.02			
		Steel	0.0	Tube deposits:	Below oil level	Lt var
		Cu	-0.12		At and above oil level	Lt var
		Mg	+0.08			

Metal discoloration, deposits,
pitting, or etching:

		Al	Lt yellow	Test Conditions	
		Ti	Brown & blue	Sample temperature, °F	385
		Ag	Lt yellow	Sample volume, ml	200
		Steel	Blue	Air rate, liter/hr	130
		Cu	L green & yellow	Condensate return	Yes
		Mg	Yellow		

TABLE 142. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-21 AT 385°F

Sample Data									
Vis, cs/100°F				100°F Vis Increase, %		Vis, cs/210°F		Overhead Sample	
Initial				--		3.76		Acidity, mg KOH/g	
16 hr				14.8		4.13		Vis, cs/100°F	
24 hr				25.2		4.39		mg KOH/g	
40 hr				55.4		5.13		cs/100°F	
48 hr				75.6		5.63		cs/100°F	
Metal Specimen Data									
Test Cell Data									
Weight change, mg/cm ² :									
Al		0.0		Sludge in oil:		200-mesh filter		None	
Ti		+0.02				Centrifuge		None	
Ag		-0.04							
Steel		0.0							
Cu		-0.16							
Mg		-0.04							
Test Conditions									
Metal discoloration, deposits, pitting, or etching:									
Al		Lt yellow		Sample temperature, °F		385			
Ti		Brown		Sample volume, ml		200			
Ag		Lt yellow		Air rate, liter/hr		130			
Steel		Blue		Condensate return		No			
Cu		Brown & green							
Mg		NC							

TABLE 143. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-21 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	15.11	--	3.76	0.07	
16 hr	19.08	26.3	4.93	0.76	
24 hr	20.36	34.7	5.22	0.82	
40 hr	24.48	62.0	6.06	1.21	
48 hr	41.36	174	7.61	26.4	54

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	-0.02		Centrifuge	None
	Ag	-0.06			
	Steel	0.0	Tube deposits:	Below oil level	Dark var
	Cu	-0.27		At and above oil	
	Mg	-0.73		level	Dark var

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt yellow	Sample temperature, °F	385
Ti	Brown & blue	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Orange		
Mg	Yellow & pitted		

TABLE 144. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 0-65-23 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.62	--	3.15	0.20	--			
16 hr	17.34	37.4	3.87	0.32	53.0			
24 hr	20.50	62.4	4.31	0.56	68.5			
40 hr	27.44	117	5.21	0.81	79.4			
48 hr	30.46	141	5.57	0.84	80.1	52	1.13	7.90

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge	Trace
	Ag	0.0			
	Steel	0.0	Tube deposits:	Below oil level	None
	Cu	-0.02		At and above oil level	None
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	NC	Sample temperature, °F	385
Ti	Lt tan	Sample volume, ml	200
Ag	Lt Yellow	Air rate, liter/hr	130
Steel	Peacock	Condensate return	No
Cu	Orange		
Mg	NC		

TABLE 145. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-23 AT 385°F

<u>Sample Data</u>						
	<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>	
Initial	12.62	--	3.15	0.20		
16 hr	17.02	34.9	3.85	0.32		
24 hr	20.18	59.9	4.28	0.56		
40 hr	27.72	120	5.25	0.85		
48 hr	31.24	148	5.70	0.86		50
<u>Metal Specimen Data</u>						
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	+0.02		Centrifuge	Trace
		Ag	0.0			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	-0.04		At and above oil level	None
		Mg	+0.02			
<u>Metal discoloration, deposits, pitting, or etching:</u>						
		Al	NC	Sample temperature, °F 385		
		Ti	Lt tan	Sample volume, ml 200		
		Ag	Lt yellow	Air rate, liter/hr 130		
		Steel	Peacock	Condensate return Yes		
		Cu	Orange			
		Mg	NC			

TABLE 146. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-24 AT 385°F

Sample Data				Overhead Sample			
Vis., cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	15.17	--	0.13	--			
16 hr	16.04	5.7	0.09	34.2			
24 hr	16.82	10.9	0.21	48.3			
40 hr	18.73	23.5	0.54	70.7			
48 hr	20.35	34.1	0.64	77.9	45	1.07	11.69
Metal Specimen Data				Test Cell Data			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
				Centrifuge			
				Tube deposits: Below oil level			
				At and above oil level			
				None			
				None			
Metal discoloration, deposits, pitting, or etching:				Test Conditions			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu				No			
Mg				385			
				200			
				130			
				None			

TABLE 147. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-24 AT 385°F

<u>Sample Data</u>						
	<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>	
Initial	15.17	--	3.72	0.13		
16 hr	15.94	5.1	3.82	0.09		
24 hr	16.66	9.8	3.95	0.22		
40 hr	18.37	21.1	4.22	0.54		
48 hr	19.79	30.5	4.48	0.62	42	
<u>Metal Specimen Data</u>						
<u>Weight change, mg/cm²:</u>		Al	0.0	<u>Sludge in oil:</u>	200 -mesh filter	Trace
		Ti	0.0		Centrifuge	Trace
		Ag	0.0	<u>Tube deposits:</u> Below oil level None Az and above oil level None		
		Steel	-0.02			
		Cu	-0.08			
		Mg	0.0			
<u>Metal discoloration, deposits,</u> <u>etching, or etching:</u>						
		Al	NC	<u>Sample temperature, °F</u> 385		
		Ti	Lt tan	<u>Sample volume, ml</u> 200		
		Ag	Lt yellow	<u>Air rate, liter/hr</u> 130		
		Steel	Blue	<u>Condensate return</u> Yes		
		Cu	Orange			
		Mg	NC			

TABLE 148 RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON C-65-27 AT 385°F

Sample Data					Overhead Sample		
Vis., cs/100°F	100°F Vis Increase, %	Vis., cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis., cs/100°F
Initial	--	3.99	0.26	--			
16 hr	12.8	4.38	0.60	44.0			
24 hr	24.8	4.76	0.73	63.0			
40 hr	107	7.26	1.30	93.4			
48 hr	1768	43.82	3.48	97.6	63	1.25	10.54
Metal Specimen Data					Test Cell Data		
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None
Al					Centrifuge		
Ti							
Ag							
Steel							
Cu							
Mg							
Metal discoloration, deposits, pitting, or etching					Tube deposits:		
Al					Below oil level		
Ti					At and above oil level		
Ag							
Steel							
Cu							
Mg							
Test Conditions							
Sample temperature, °F					385		
Sample volume, ml					200		
Air rate, liter/hr					130		
Condensate return					No		

(a) Insufficient sample.

TABLE 149. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-27 AT 385°F

<u>Sample Data</u>		<u>Vis., cs/100°F</u>	<u>100°F Vis Increase, %</u>	<u>Vis., cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>
Initial		15.19	--	3.99	0.26	
16 hr		16.82	10.7	4.32	0.63	
24 hr		18.24	20.1	4.61	0.89	
40 hr		25.38	67.1	6.06	1.10	
48 hr		49.59	226	10.66	2.27	58

<u>Metal Specimen Data</u>		<u>Test Cell Data</u>	
Weight change, mg/cm ² :		Sludge in oil:	200-mesh filter
Al	+0.02		Centrifuge
Ti	+0.02		(a)
Ag	+0.02		
Steel	+0.02	Tube deposits:	Below oil level
Cu	0.0		At and above oil level
Mg	+0.18		Lt var

<u>Metal discoloration, deposits, pitting, or etching:</u>		<u>Test Conditions</u>	
Al	Lt yellow	Sample temperature, °F	385
Ti	Lt brown	Sample volume, ml	200
Ag	Lt yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Orange		
Mg	Orange		

(a) Insufficient sample.

TABLE 150. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-28 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	12.94	--	3.27	0.30	--			
16 hr	14.85	14.8	3.45	0.22	25.1			
24 hr	25.73	98.8	4.79	6.23	38.1			
40 hr	418.8	3,136	27.86	17.22	65.0			
48 hr	1650	12,650	73.21	21.8	66.9	47	50.9	8.50

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil: 200-mesh filter	None
	Ti	-0.02		
	Ag	-0.12	Tube deposits: Below oil level At and above oil level	None
	Steel	+0.08		
	Cu	-0.18		
	Mg	+0.14		

Test Cell Data

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	NC
Ag	Lt yellow
Steel	Black
Cu	Orange
Mg	Grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 151. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-28 AT 385°F

Sample Data		Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial		12.94	--	3.27	0.30	
16 hr		14.74	13.9	3.44	0.22	
24 hr		16.44	27.0	3.66	1.49	
40 hr		244.2	1787	19.70	16.15	
48 hr		861.7	6559	46.30	18.75	46
Metal Specimen Data		Test Cell Data				
Weight change, mg/cm ² :	Al	-0.02		Sludge in oil:	200-mesh filter	None
	Ti	+0.02			Centrifuge	None
	Ag	-0.18		Tube deposits:	Below oil level	None
	Steel	+0.06			At and above oil	None
	Cu	-0.40			level	None
	Mg	+0.08				
Metal discoloration, deposits, pitting, or etching:		Test Conditions				
	Al	NC		Sample temperature, °F		385
	Ti	NC		Sample volume, ml		200
	Ag	Lt yellow		Air rate, liter/hr		130
	Steel	Black		Condensate return		Yes
	Cu	Slight etching				
	Mg	Grey				

TABLE 152. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON O-65-31 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.40	--	3.23	0.08	--			
16 hr	15.37	14.7	3.54	0.22	34.1			
24 hr	16.42	22.5	3.68	0.36	47.3			
40 hr	19.25	43.7	4.10	0.61	66.5			
48 hr	21.30	59.0	4.39	0.65	72.0	43	1.23	10.25

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	0.0
	Steel	0.0
	Cu	+0.04
	Mg	+0.12

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	Trace
Tube deposits:	Below oil level	None
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Lt brown
Ag	Lt yellow
Steel	Blue-brown
Cu	Orange
Mg	Lt grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

TABLE 153. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON O-65-31 AT 385°F

<u>Sample Data</u>						
	<u>Vis, cs/100°F</u>	<u>100°F Vis increase, %</u>	<u>Vis, cs/210°F</u>	<u>Neut. No., mg KOH/g</u>	<u>Oil Loss, wt %</u>	
Initial	13.40	--	3.23	0.08		
16 hr	15.31	14.3	3.53	0.22		
24 hr	16.36	22.1	3.68	0.36		
40 hr	19.06	42.2	4.07	0.61		
48 hr	21.12	57.6	4.35	0.65		44
<u>Metal Specimen Data</u>			<u>Test Cell Data</u>			
Weight change, mg/cm ² :			Al	0.0	Sludge in oil:	200-mesh filter
			Ti	+0.02		Centrifuge
			Ag	0.0		
			Steel	+0.02	Tube deposits:	Below oil level
			Cu	+0.02		At and above oil level
			Mg	+0.04		
Metal discoloration, deposits, pitting, or etching:			<u>Test Conditions</u>			
	Al	NC			Sample temperature, °F	385
	Ti	Lt brown			Sample volume, ml	200
	Ag	Lt yellow			Air rate, liter/hr	130
	Steel	Blue-brown			Condensate return	Yes
	Cu	Orange				
	Mg	Lt grey				

TABLE 154. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-114 AT 375°F

Sample Data					Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	-	3.54	0.10	-	-	-	-	
16 hr	5.1	3.71	0.52	26.1	-	-	-	
24 hr	9.3	3.78	0.56	39.0	-	-	-	
40 hr	18.4	4.06	0.70	63.1	-	-	-	
48 hr	26.8	4.31	0.83	73.1	41	1.12	11.08	
Metal Specimen Data					Test Cell Data			
Weight change, mg/cm ² :					Sludge in oil:	200-mesh filter	None	
Al						Centrifuge	0.15 ml/25	
Ti								
Ag								
Steel					Tube deposits:	Below oil level	Lt var	
Cu						At and above oil level	None	
Mg								
Metal discoloration, deposits, pitting, or etching:					Test Conditions			
Al						Sample temperature, °F	375	
Ti						Sample volume, ml	200	
Ag						Air rate, liter/hr	130	
Steel						Condensate return	No	
Cu								
Mg								

TABLE 155. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-114 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	13.53	--	3.54	0.10	--			
16 hr	14.61	8.0	3.78	0.63	33.4			
24 hr	15.11	11.7	3.85	0.67	49.2			
40 hr	17.26	27.6	4.39	0.91	79.5			
48 hr	20.64	52.5	5.00	1.19	91.8	55	1.43	11.20

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	Trace
	Ag			
	Steel	Tube deposits:	Below oil level	Lt carbon
	Cu		At and above oil level	Lt var
	Mg			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Purple	Sample temperature, °F	385
Ti	Dark purple	Sample volume, ml	200
Ag	Purple	Air rate, liter/hr	130
Steel	Purple-green	Condensate return	No
Cu	Brown		
Mg	Purple		

TABLE 156. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
CN 65-L-115 AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.33	--	3.59	0.09	--			
16 hr	15.16	5.8	3.76	0.27	14.7			
24 hr	15.44	7.7	5.79	0.31	21.5			
40 hr	16.15	12.7	3.93	0.39	34.8			
48 hr	16.57	15.6	4.02	0.43	40.5	26	1.35	11.15

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter	None
	Ti		Centrifuge	0.05 ml/25
	Ag			
	Steel	Tube deposits:	Below oil level	Lt var
	Cu		At and above oil level	None
Metal discoloration, deposits, pitting, or etching:	Mg			
	Al			
	Ti			
	Ag			
	Steel			

Test Conditions

Tan	Sample temperature, °F	375
Grey	Sample volume, ml	200
Tan	Air rate, liter/hr	130
Blue-green	Condensate return	No
Slight pitting		
Grey		

TABLE 157. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-115 AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.33	--	3.59	0.09	--			
16 hr	15.34	7.0	3.78	0.34	18.0			
24 hr	15.71	9.6	3.84	0.40	26.3			
40 hr	16.74	16.8	4.04	0.48	41.0			
48 hr	17.55	22.5	4.19	0.49	47.2	35	1.36	11.19

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	Sludge in oil	200-mesh filter	None
	Ti	-0.02	Centrifuge	0.30 ml/25
	Ag	-0.02		
	Steel	+0.02	Tube deposits: Below oil level	None
	Cu	-0.16	At and above oil level	Lt var
	Mg	-0.06		

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt tan	Sample temperature, °F	385
Ti	Dark grey	Sample volume, ml	200
Ag	Tan	Air rate, liter/hr	130
Steel	Lt blue-green	Condensate return	No
Cu	Dark brown		
Mg	Grey-brown		

TABLE 158. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON 65-L-116 AT 375°F

Sample Data						Overhead Sample		
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	4.29	0.11	--				
16 hr	5.4	4.49	0.56	15.3				
24 hr	8.8	4.57	0.66	21.9				
40 hr	13.5	4.78	0.88	33.9				
48 hr	16.8	4.89	0.98	39.0	27	2.21	11.04	
Metal Specimen Data			Test Cell Data					
Weight change, mg/cm ² :			Al	0.0	Sludge in oil:		200-mesh filter	None
			Ti	+0.04			Centrifuge	None
			Ag	0.0	Tube deposits:		Below oil level	Lt var
			Steel	0.0			At and above oil level	None
			Cu	-0.06				
			Mg	0.0				
Metal discoloration, deposits, pitting, or etching:			Al	NC	Test Conditions			
			Ti	Lt grey	Sample temperature, °F		375	
			Ag	White	Sample volume, ml		200	
			Steel	Blue	Air rate, liter/hr		130	
			Cu	Lt yellow	Condensate return		No	
			Mg	NC				

TABLE 159. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1003(a) AT 375°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	14.81	--	3.80	0.10	--			
16 hr	15.92	7.5	4.00	0.54	20.0			
24 hr	16.28	9.9	4.06	0.56	29.1			
40 hr	17.37	17.3	4.29	0.64	45.5			
48 hr	18.22	23.0	4.45	0.84	52.4	33	1.58	11.06

Metal Specimen Data

Weight change, mg/cm ² :	Al	0.0
	Ti	0.0
	Ag	0.0
	Steel	+0.04
	Cu	-0.06
	Mg	+0.08

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge	None
Tube deposits:	Below oil level	Lt var
	At and above oil level	None

Metal discoloration, deposits,
pitting, or etching:

Al	NC
Ti	Grey
Ag	Lt tan
Steel	Blue
Cu	Lt yellow
Mg	NC

Test Conditions

Sample temperature, °F	375
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Blend (equal parts) of 65-L-114, 65-L-115, and 65-L-116.

TABLE 160. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1003(a) USING WATER-SATURATED AIR AT 375°F

Sample Data					Overhead Sample			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F	
Initial	--	3.80	0.10	--				
16 hr	6.8	3.99	0.61	19.9				
24 hr	9.5	4.05	0.64	29.1				
40 hr	16.0	4.25	0.74	46.2	33	2.16	10.88	
48 hr	20.9	4.40	0.89	53.6				
Metal Specimen Data					Test Cell Data			
Weight change, mg/cm ² :					Sludge in oil: 200-mesh filter Centrifuge			
Al					None			
Ti					0.05 ml/25			
Ag								
Steel					Tube deposits: Below oil level At and above oil level			
Cu					Lt var None			
Mg								
Metal discoloration, deposits, pitting, or etching:					Test Conditions			
Al					Sample temperature, °F			
Ti					Sample volume, ml			
Ag					Air rate, liter/hr			
Steel					Condensate return			
Cu					No			
Mg								

(a) Blend (equal parts) of 65-L-114, 65-L-115, and 65-L-116.

TABLE 161. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt., g	Oil Loss, wt %	Overhead Sample	
							Acidity, mg KOH/g	Vis, cs/100°F
Initial	16.54	--	4.24	0.15	--			
16 hr	18.79	13.6	4.64	0.60	34.7			
24 hr	20.33	22.9	4.96	0.64	50.4			
40 hr	26.26	58.8	5.99	1.03	75.3			
48 hr	32.34	95.5	7.06	1.47	82.0	50	1.57	9.94

Metal Specimen Data

<u>Test Cell Data</u>			
Weight change, mg/cm ² :	Al	Sludge in oil:	200-mesh filter
	Ti		Centrifuge
	Ag		
	Steel	Tube deposits:	Below oil level
	Cu		At and above oil level
	Mg		None
			Trace

Metal discoloration, deposits,
pitting, or etching:

Al	Lt purple
Ti	Brownish purple
Ag	Tan
Steel	Blue
Cu	Yellow-green
Mg	Grey

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liter/hr	130
Condensate return	No

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 162. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385°F

Sample Data

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	16.54	--	4.24	0.15	
16 hr	18.64	12.7	4.63	0.66	
24 hr	20.19	22.1	4.91	0.70	
40 hr	25.34	53.2	5.84	1.01	
48 hr	31.29	89.2	6.87	1.32	49

Metal Specimen Data

Test Cell Data

Weight change, mg/cm ² :	Al	0.0	Sludge in oil:	200-mesh filter	None
	Ti	0.0		Centrifuge	Trace
	Ag	0.0			
	Steel	+0.02	Tube deposits:	Below oil level	Lt var
	Cu	-0.16		At and above oil level	Lt var
	Mg	0.0			

Metal discoloration, deposits,
pitting, or etching:

Test Conditions

Al	Lt brown	Sample temperature, °F	385
Ti	Brown-red	Sample volume, ml	200
Ag	Yellow	Air rate, liter/hr	130
Steel	Blue	Condensate return	Yes
Cu	Yellow-green		
Mg	Lt grey		

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 163. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1007(a) AT 385° F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		16.54	--	4.24	0.15	
16 hr		18.70	13.1	4.64	0.69	
24 hr		20.17	21.9	4.90	0.70	
40 hr		24.82	50.1	5.74	0.98	
48 hr		29.59	78.7	6.51	1.37	50
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.04	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	0.0			
		Steel	-0.02	Tube deposits:	Below oil level	None
		Cu	-0.18		At and above oil level	None
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Brown-purple	Sample temperature, °F		
		Ag	Lt tan	Sample volume, ml		
		Steel	Blue	Air rate, liter/hr		
		Cu	Yellow-brown	Condensate return		
		Mg	Lt grey			

(a) Blend (1:1) of O-62-3 and O-62-6.

TABLE 164. RESULTS OF NONREFLUX OXIDATION-CORROSION TEST
ON J-1011(a) AT 385°F

<u>Sample Data</u>				<u>Overhead Sample</u>			
Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Overhead Wt, g	Oil Loss, wt %	Acidity, mg KOH/g	Vis, cs/100°F
Initial	--	5.35	0.14	--			
16 hr	7.9	5.63	0.04	4.0			
24 hr	10.4	5.71	0.06	5.4			
40 hr	14.0	5.89	0.07	8.0			
48 hr	17.6	6.00	0.08	8.9	13	1.73	18.05
<u>Metal Specimen Data</u>				<u>Test Cell Data</u>			
Weight change, mg/cm ² :				Sludge in oil: 200-mesh filter			
Al				Centrifuge			
Ti							
Ag				Tube deposits: Below oil level			
Steel				At and above oil level			
Cu							
Mg							
Metal discoloration, deposits, pitting, or etching:				<u>Test Conditions</u>			
Al				Sample temperature, °F			
Ti				Sample volume, ml			
Ag				Air rate, liter/hr			
Steel				Condensate return			
Cu							
Mg							

(a) Blend (1:1) of O-64-13 and O-64-25.

TABLE 165. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1011(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.38	--	5.35	0.14	
16 hr		30.69	8.1	5.63	0.07	
21 hr		31.27	10.2	5.71	0.07	
40 hr		32.79	15.5	5.91	0.09	
48 hr		33.76	19.0	6.02	0.11	15
<u>Metalspecimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	-0.02	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	0.05 ml/25
		Ag	+0.04			
		Steel	0.0	Tube deposits:	Below oil level	None
		Cu	-0.84		At and above oil	
		Mg	-0.02		level	None
Metal discoloration, deposits, pitting, or etching:		<u>Test Conditions</u>				
	Al	NC		Sample temperature, °F		385
	Ti	Lt tan		Sample volume, ml		200
	Ag	Lt grey		Air rate, liter/hr		130
	Steel	Brown		Condensate return		Yes
	Cu	Moderate etching				
	Mg	NC				

(a) Blend (1:1) of O-64-13 and O-64-25.

TABLE 166. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1020(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		27.88	--	5.17	0.17	
16 hr		29.89	7.2	5.43	0.06	
24 hr		30.70	10.1	5.59	0.07	
40 hr		32.20	15.5	5.74	0.14	
48 hr		33.18	19.0	5.86	0.15	17
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	+0.02	Tube deposits: Below oil level At and above oil level		
		Steel	+0.06			
		Cu	+0.10			
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan			
		Ag	Lt yellow			
		Steel	Purple			
		Cu	Brown			
		Mg	NC			
				Sample temperature, °F		385
				Sample volume, ml		200
				Air rate, liter/hr		130
				Condensate return		Yes

(a) Blend (1:1) of O-64-2 and O-64-13.

TABLE 167. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1021(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.07	--	5.19	0.04	
16 hr		29.90	6.5	5.42	0.11	
24 hr		30.45	8.5	5.51	0.17	
40 hr		31.38	11.8	5.64	0.26	
48 hr		31.95	13.8	5.72	0.29	13
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	0.0	Sludge in oil:	200-mesh filter	None
		Ti	0.0		Centrifuge	None
		Ag	0.0	Tube deposits: Below oil level At and above oil level		
		Steel	0.0			
		Cu	0.0			
		Mg	0.0			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan			
		Ag	Lt yellow			
		Steel	Blue-green			
		Cu	Yellow-red			
		Mg	NC			
				Sample temperature, °F		385
				Sample volume, ml		200
				Air rate, liter/hr		130
				Condensate return		Yes

(a) Blend (1:1) of O-64-2 and O-64-25.

TABLE 168. RESULTS OF REFLUX OXIDATION-CORROSION TEST
ON J-1025(a) AT 385°F

<u>Sample Data</u>		<u>Vis,</u> <u>cs/100°F</u>	<u>100°F Vis</u> <u>Increase, %</u>	<u>Vis,</u> <u>cs/210°F</u>	<u>Neut. No.,</u> <u>mg KOH/g</u>	<u>Oil Loss,</u> <u>wt %</u>
Initial		28.19	--	5.23	0.12	
16 hr		30.01	6.5	5.47	0.05	
24 hr		30.76	9.1	5.57	0.10	
40 hr		31.75	12.6	5.75	0.15	
48 hr		32.54	15.4	5.84	0.17	15
<u>Metal Specimen Data</u>		<u>Test Cell Data</u>				
Weight change, mg/cm ² :		Al	+0.02	Sludge in oil:	200-mesh filter	None
		Ti	+0.06		Centrifuge	None
		Ag	-0.02			
		Steel	+0.06	Tube deposits:	Below oil level	None
		Cu	+0.08		At and above oil level	None
		Mg	+0.02			
Metal discoloration, deposits, pitting, or etching:		Al	NC	<u>Test Conditions</u>		
		Ti	Lt tan	Sample temperature, °F		385
		Ag	Lt yellow	Sample volume, ml		200
		Steel	Purple	Air rate, liter/hr		130
		Cu	Brown	Condensate return		Yes
		Mg	Lt yellow			

(a) Blend (equal parts) of O-64-2, O-64-13, and O-64-25.

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May 9, 1966

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